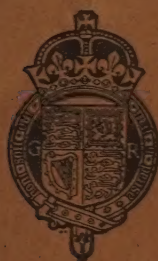


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IMPERIAL AGRICULTURAL RESEARCH
CONFERENCE, 1927

Abstracts of Papers
on
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to September, 1928.



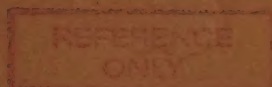
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The present volume is a continuation, for 1927-8, of a Volume prepared for the Imperial Agricultural Research Conference, 1927, containing abstracts of papers published in the academic year October, 1926, to September, 1927, dealing with agricultural research work in the United Kingdom.

The 1927-8 papers abstracted have been limited to those dealing with results or methods of work. The abstracts have been made by the investigators themselves. They have been arranged on the basis of subjects as shown in the Contents Sheet. In the case of each author the research institute or advisory centre is shown. Under each subject research institute work is given first, followed by advisory centre work.

Copies of the volume for 1926-7 are still available, price 1s. net, post free.

Ministry of Agriculture and Fisheries,
10, Whitehall Place,
London, S.W. 1.
May, 1929.

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(1) SOILS AND PLANT NUTRITION.

ROTHAMSTED EXPERIMENTAL STATION.

CROWTHER (E.M.). **The Determination of Hydrogen Ion Concentration.** *Chem. Yr. Bk.*, 1928, pp. 610-619.

The theoretical basis of the measurement of reaction or hydrogen ion concentration is given in a simple form and several of the more important colorimetric and electrometric methods are described with sufficient practical working details and tabulated reference data to enable the most suitable method to be selected and used in general laboratory work.

CROWTHER (E. M.). **Soils and Fertilisers.** *Ann. Rep. Soc. Chem. Ind.*, 1928, vol. xii, pp. 454-488.

This report summarises for the year 1927 the progress of research work on soils and fertilisers and the development of the fertiliser industry. It includes references to over 200 of the more important papers and their abstracts. Especial attention is given to the discussion of Russian pedological work, the reclamation of alkali soils, the determination of available plant nutrients in soils by plant physiological methods and the technique of field experimentation with fertilisers.

FISHER (R. A.). **Further note on the capillary forces in an ideal soil.** *Journ. Agric. Sci.*, 1928, vol. xviii, pp. 406-410.

The new observations of Haines on the pressure deficiency of liquid in a soil-like aggregate confirm the theoretical deduction that the pressure deficiency falls off with increasing water content, but do not justify his belief in a high static stress as saturation is approached.

A theorem is established connecting the static stress at any water content with the pressure deficiency and the dry area of the surface. This, together with general considerations of the energy conditions of physical equilibria, appears to dispose of the two assumptions from which the high values for the cohesive stress at saturation have been deduced.

GRAY (P. H. H.). **The formation of indigotin from indol by soil bacteria.** *Proc. Roy. Soc. B.*, 1928, vol. cii.

A study of the physiology and biochemistry of new species of soil bacteria that decompose the toxic compound indol, with especial reference to the action of *Pseudomonas indoloxidans*. The indol is converted rapidly into the insoluble indigotin; for this reaction the organism needs a source of energy such as amino-acids, dextrose, glycerol, fatty acids, or alcohols. The conversion is effected quantitatively and appears to be carried out by means of an extra-cellular enzyme.

GRAY (P. H. H.) & THORNTON (H. G.). **The estimation of bacterial numbers in soil by direct counts from stained films.** *Nature*, 1928, vol. cxxii.

A preliminary note concerning a new method of counting soil bacteria through the microscope.

HORTICULTURAL RESEARCH STATION, EAST MALLING.

GRUBB (N. H.). **An Analysis of the Effects of Potash Fertilisers on Apple Trees at East Malling.** *Journ. Pom. Hort. Sci.*, 1928-9, vol. vii, pp. 32-59.

The application of sulphate of potash to part of the "Pruning Plot" at East Malling has yielded very definite results. In comparison with the untreated trees, with a very few apparent exceptions, those which have received potash have shown :—

1. Very much less "leaf scorch."
2. Greatly improved cropping, in both quantity and size of fruit.
3. Greatly increased growth, as indicated by increase in girth of stem, weight of prunings, and number of shoots.

Both 2 and 3 apply to Worcester Pearmain, which is resistant to "leaf scorch," as well as to other varieties.

4. A probable tendency, in certain exceptional cases, towards temporarily reduced cropping as a result of the greater vigour of the tree.
5. A probable tendency in some cases towards a heavier "set" of fruit.
6. No consistent tendency towards more highly coloured fruit. Most of the "leader tipped" trees showed the reverse tendency, probably owing to the shading effect of the denser foliage where potash was applied.
7. An apparent tendency, after the first application of potash, towards earlier maturity of fruit. In most cases this tendency did not persist.
8. Greatly improved financial returns.

ROWETT RESEARCH INSTITUTE.

GODDEN (W.) & GRIMMETT (R. E. R.). **Factors affecting the Iron and Manganese Content of Plants with Special Reference to Herbage causing "Pining" and "Bush Sickness."** *Journ. Agric. Sci.*, 1928, vol. xviii.

"Pining" in sheep appears to be identical with the disease "Bush Sickness" in New Zealand caused by deficiency of iron in the pasture. Pot experiments, some on sand, some on local soil and others on "Pining" soil were laid down to determine the factors affecting the assimilation of iron and manganese by the plant. Results showed that manganese is more easily taken up from the soil by the plant than is iron. On a given culture medium lack of drainage is the most potent factor in increasing the manganese content and the manganese iron ratio of the crop. Liming tends to decrease both of these.

ORR (J. B.), KELLY (F. C.) & STUART (G. L.). **The Effect of Iodine Manuring on the Iodine Content of Plants.** *Journ. Agric. Sci.*, 1928, vol. xviii.

Water culture and pot culture experiments with different plants have shown that the addition of iodine either to the water or the soil increases the iodine content of the plant. This is of importance in view of the theory that goitre is due to a deficiency of iodine. Manuring with iodine would thus afford a simple method of increasing the iodine content of food plants.

**UNIVERSITY OF BRISTOL AND LONG ASHTON FRUIT
RESEARCH STATION.**

LING (A. W.). **The Improvement of Poor Pastures, with Special Reference to the Manuring of Acid Pastures.** *Journ. Bath and West and South. Count. Soc.*, 1927-28, 6 ser., vol. xi, p. 109.

This publication is the final report of a uniform series of grass land manurial experiments conducted in the West of England from 1924 to 1928 in conjunction with the Bath and West of England Society. Conclusions are drawn relative to the action of high grade basic slag, finely ground North African phosphate, superphosphate, and lime.

LING (A. W.). **Some Aspects of the Sugar Beet Problem.** *Agric. Prog.*, 1928.

An abridged paper read at the A.E.A. Summer Meeting held at Bangor, 1927, on the results obtained from the Sugar Beet experiments carried out in the West of England, 1927. The results are discussed under the two following headings:—

- (a) Effect of Manures on yield ;
- (b) Effect of Manures on sugar content.

A summary of the discussion which followed is also given.

LING (A. W.). **Sugar Beet Experiments in the West of England 1927.** *Bull. No. 2, Univ. Bristol.*

A continuation of Bulletin No. 1, containing the results obtained from a uniform set of manurial trials conducted in Gloucestershire (5 centres), Herefordshire (9 centres), Somerset (5 centres), Wiltshire (9 centres), and Worcestershire (11 centres) and a report on the Sugar Beet Conference held at Bristol on the 23rd February, 1928.

The results of the observations on the experiments are discussed under the following headings: (a) The best time to apply nitrogen, (b) The quantity of nitrogen, (c) Forms of nitrogen, (d) Width of drilling trial.

Hints to sugar beet growers and conclusions from trials are also discussed under the following headings: (i) Soil, (ii) Place in rotation, (iii) Quantity of seed per acre, (iv) Cultivations, (v) Width between rows, (vi) Striking out singling, (vii) Manuring, (viii) Harvesting.

WALLACE (T.). **The Effects of Manurial Treatments on the Chemical Composition of Gooseberry Bushes—I. Effects on Dry Matter, Ash and Ash Constituents of Leaves and Stems of Terminal Shoots and of Fruits ; and on Total Nitrogen of Fruits.** *Journ. Pom. Hort. Sci.*, July, 1928, vol. vii, Nos. 1 & 2.

Leaves, stems and berries taken from gooseberry bushes which had been growing under various manurial treatments for six seasons were analysed for dry matter, ash content and ash constituents with a view to determining the extent to which the composition of these had been affected by the manurial treatments. The leaves and stems were taken from the current season growths of terminal shoots.

In the experiment the treatments "no manure" and "potassium omitted" have resulted in severe restriction in growth and cropping and in severe leaf scorch due to potassium starvation.

It is concluded from the investigation that the deficiency of potassium, which is apparent in the growth and cropping of the bushes where this element is not given is clearly reflected in the K_2O contents of the ash and the fresh material of the leaves and stems of the terminal shoots and of the berries. The differences produced in K_2O content are greater in the leaves and stems than in the berries.

UNIVERSITY OF MANCHESTER.

SMITH (A. M.). **The Relative Proportions of Exchangeable Bases in some Scottish Soils.** *Journ. Agric. Sci.*, vol. xviii, p. 68.

The relative proportions of exchangeable bases in nine soils from the East of Scotland area and the changes effected by dilute chloride solutions were examined. The changes due to N/50 solutions were large, but those due to N/500 solutions were very small, comparable to what might be expected in manurial practice and not greater than field sampling error. The content of exchangeable bases and their relative proportions, therefore, seem to be fairly permanent for any soil under normal conditions, and should prove useful as an additional characteristic of soil type.

UNIVERSITY OF OXFORD.

MORISON (C. G. T.) & CLARKE (G. R.). **Some Problems of Forest Soils.** *Forestry*, 1928, vol. ii, No. 1.

A discussion of some general problems of forest soils. An attempt has been made to indicate the direction in which forest vegetation may modify the general climatic type of soil. The characteristic impoverishment of true podsol soils may be very materially modified by the surface vegetation in such a manner that the characteristic profile may never be developed. The need for further investigation of this and other problems dealing with the close association of tree growth and soil character is emphasized.

UNIVERSITY OF READING.

NICHOLSON (H. H.). **Liming Experiments in Berks, Dorset, Hants and Oxford, 1922 seq.** *Agric. Prog.*, 1928.

Observations on the effects of graded dressings of ground limestone (0-60 cwts. per acre) on light or loamy soils of varying degrees of acidity, the extent of field variations of lime requirement from one plot to its neighbour, the annual variation between successive samplings, time required to achieve the maximum results, effects on the lime requirement figure and rate of disappearance of applied limestone.

UNIVERSITY COLLEGE OF NORTH WALES, BANGOR.

ROBINSON (G. W.). **Forest Soils.** *Emp. For. Journ.*, 1927, vol. vi.

The problems affecting forest soils differ from those affecting agricultural soils. The study of the plant nutrient cycle and the changes affecting the organic matter are of special importance. The significance of the genetic classification of soils and their study in profile is discussed.

ROBINSON (G. W.). **The Relative Importance of Laboratory and Field Data in the Classification of Soils.** *Proc. 1st Cong. Soil Sci., Washington, D.C.*, 1927.

Whilst the great world types of soils can be generally identified by the field examination of the profile, laboratory data are of value in giving quantitative expression to the soil characters and are also of value in the sub-division of the main types.

ROBINSON (G. W.). **The Mapping of Soils of Small Areas.** *Proc. 1st Cong. Soil Sci., Washington, D.C.*, 1927.

The characteristics whereby soils are arranged into their main types are not always suitable as a basis for detailed mapping. Characteristics

such as texture, soil reaction, soil content, etc., may be used in the final differentiation of soils.

ROBINSON (G. W.). **The Nature of Clay and its Significance in the Weathering Cycle.** *Nature*, 1928, vol. cxxi.

From a study of the silica : sesquioxide ratio of soils from North Wales and elsewhere it is concluded that the primary product of the chemical weathering of crystalline or consolidated rocks is a mixture of hydrated aluminium and iron silicates, in which the ratio of silica to sesquioxide is 2 : 1. This ratio is modified by the leaching processes, which result in profile development.

The excess of silicic acid in the clay of alluvia and unconsolidated sediments is probably attributable to the concomitant deposition of this constituent, which is a product of silicate hydrolysis. The effect of erosion in modifying the soil profile is mentioned.

ROBINSON (G. W.), JONES (J. O.) & EVANS (R. J.). **The Degree of Humification of Soil Organic Matter.** *Proc. 1st Cong. Soil Sci., Washington, D.C., 1927.*

A study of the humification of the organic matter of a number of soils by the peroxide method of Robinson and Jones determining the organic matter by dry combustion. The degree of humification is generally greater than 80 per cent.

ROBINSON (G. W.), JONES (J. O.) & HUGHES (D. O.). **Soil Survey of Wales. Progress Report, 1925-27.** *Welsh Journ. Agric.*, 1928, vol. iv.

An account is given, with maps and analyses, of the soils of three areas, namely the Vale of Glamorgan, Eastern Anglesey and the Wrexham district.

WILLIAMS (RICE). **The Determination of Exchangeable Calcium in Carbonate-free Soils.** *Journ. Agric. Sci.*, 1928, vol. xviii, pp. 439-445.

Exchangeable calcium in carbonate-free soils may be conveniently determined by using semi-normal acetic acid as a leaching agent instead of normal sodium chloride solution as used in the well-known Hissink method. The results with acetic acid show good agreement with those by the Hissink method.

EDINBURGH AND EAST OF SCOTLAND COLLEGE OF AGRICULTURE.

CUNNINGHAM (A.). **Edelmist.** *Scott. Journ. Agric.*, 1927, vol. x, pp. 434-439, with 1 plate.

"Edelmist" is farmyard manure which has been fermented at a high temperature by a process patented by Captain Krantz in Bavaria. The dung is piled up in shallow layers, thus ensuring thorough aeration with rise of temperature to 55° to 65°C. When the desired temperature has been reached the layer of manure is compacted by tramping, covered with fresh manure and allowed to remain untouched for about four months.

The experimental data available indicate that the manurial value of "Edelmist" is decidedly higher than that of ordinary farmyard manure, and the losses in the making of "Edelmist" are only about one-half those of ordinary manure.

Illustrations of the special dungsteads used in the making of "Edelmist" are included.

OGG (W. G.). **The Contributions of Glinka and the Russian School to the Study of Soils.** *Scott. Geog. Mag.*, March, 1928, vol. xlv, p. 100.

The author reviews the notable contributions made to soil science, and particularly to soil classification and the field study of soils, by the late Professor Glinka.

After a brief account of the life and career of Glinka there follows a description of the attempts by Dokutschajeff and Sibirceff to evolve a genetic system of soil classification. Glinka developed and extended this work and brought forward a system of classification which is based on climate and especially on moisture and temperature. A brief description is given of Glinka's five main groups, viz.:—(1) Laterite Soils; (2) Podsol Soils; (3) Steppe Soils; (4) Solonetz Soils; (5) Marsh Soils.

OGG (W. G.) & DOW (W. T.). **An Acidity Survey of the Soils of Two Parishes in Berwickshire.** *Scott. Journ. Agric.*, July, 1928, vol. xi, No. 3.

A detailed survey was made of the reaction of every field of two parishes A and B in the South-East of Scotland. The results show that although the parishes are only 10 miles apart there is a remarkable difference in soil reaction, and this difference appears to be associated with marked differences in the appearance of the pasture.

In Parish A, where the pasture is good, 75 per cent. of the soils are either alkaline or only slightly acid; whilst in parish B, where the pasture is in general poor, only 9 per cent. of the soils are in that condition. Again, in parish A only 3 per cent. of the soils may be classed as extremely acid compared with 30 per cent. in parish B.

Whilst it is recognised that other factors must also be considered, the influence of reaction is regarded as being of great importance and the question is being further studied in the laboratory and in the field.

OGG (W. G.) & DOW (W. T.). **The Reaction, Exchangeable Calcium and Lime Requirement of Certain Scottish Soils.** *Journ. Agric. Sci.*, vol. xviii, pp. 131–158.

The examination of a large number of soils chiefly drawn from the South-East of Scotland showed that the majority had a pH between 5 and 6.5, a "lime requirement" of 0.05 to 0.25 per cent. CaCO_3 and an exchangeable calcium content of 0.1 to 0.45 per cent CaO . Although numerous exceptions occurred there was a general agreement between these sets of figures. A more detailed examination of an area of 6 square miles and a still more detailed study of a single farm were also carried out.

Long unploughed soils and woodland hill and heath soils were compared with cultivated soils and observations were made on the geological relationships. Attention was also paid to the differences in the various layers of the soil profile and to the crops and natural vegetation.



NORTH OF SCOTLAND COLLEGE OF AGRICULTURE.

NEWLANDS (The late GEORGE). **Certain Soil Properties in relation to Sugar Beet Growing.** *Scott. Journ. Agric.*, vol. xi, No. 2, pp. 387–392.

This paper deals with the effects of soil properties such as texture, acidity and lime requirement upon the growth of sugar beet as shown in beet growing trials carried out in the North-East of Scotland. It was found that for the range of conditions examined, in which none of the soils was heavy clay, texture did not appear to be a limiting factor. On the other hand acidity and lime deficiency had a distinctly adverse affect on the growth of beet.

NEWLANDS (The late GEORGE). **Certain Acid Soils and Growth of Sugar Beet.** *Journ. Agric. Sci.*, vol. xviii, pt. 4.

Many instances of complete or partial failure of the sugar beet crop on soils in the North-East of Scotland were investigated, including a number where there were great variations of growth in different parts of the same field. It was found that when results were obtained from one soil type there was a close correlation between growth of beet and the following factors which also correlated well with each other : pH value, lime requirement, acidity of the soil, and degree of saturation for bases.

(2) PLANT PHYSIOLOGY

(including Horticultural and Glasshouse Crops).

HORTICULTURAL RESEARCH STATION, EAST MALLING, KENT.

HATTON (R. G.), AMOS (J.), WITT (A. W.), with Appendix by HOBLYN (T. N.). **Plum Rootstocks: Their Varieties, Propagation, and Influence upon Cultivated Varieties worked thereon.** *Journ. Pom. Hort. Sci.*, July, 1928, vol. vii, Nos. 1 and 2, p. 63.

The species and varieties of root stocks used for plums are enumerated and discussed.

The reasons for using root stocks, and their desirable qualities are suggested.

The principal methods of propagation and sources of supply in Europe are described.

The behaviour of different root stocks in the nursery is compared, and the phenomenon of "incompatibility" of stock and scion described.

The work of previous investigators is summarised.

The plan of successional plantings at East Malling is detailed, and the statistical aspect of the records discussed.

Figures of the total length of wood growth, girth of stem, height and spread of the branches and total weight of tree are presented to illustrate the effect of root stock upon the vigour of different varieties.

Stock effect on habit of growth is also described.

Propensities to a suckering habit are compared and shown to be varietal.

The question of firm roothold is shown to be varietal also.

The effect of different root stocks upon (a) time of blossoming, (b) blossom production and nature of spurs, and (c) actual number of flowers, is illustrated.

The relative cropping power of young trees on different root stocks is compared.

Some general recommendations are made with regard to the specific uses of individual varieties of root stock.

TYDEMAN (H. M.). **The Influence of Rootstocks on the Blossoming of Seedling Apples.** A Progress Report. *E.M.R.S. Ann. Rep.*, 1926 and 1927 (II Supplement), pp. 51-55.

Preliminary trials as to the possible effect of dwarfing and vigorous rootstocks in shortening the "juvenile period" of apple seedlings have been carried out. The data indicate not only the dwarfing effect obtained by the use of certain rootstocks but an undoubted influence of the latter upon blossoming. Thus exactly fifty per cent. of the trees upon dwarfing and precocious rootstocks blossomed in their sixth year; of trees comprising the same individual seedlings worked upon vigorous rootstocks less than nine per cent. blossomed, whilst only one of the parent plants growing upon their own roots has blossomed.

LONG ASHTON FRUIT RESEARCH STATION.

BARKER (B. T. P.), GROVE (O.) & PICKFORD (P. T. H.). **Trial Cider and Perry Orchards.** *Ann. Rep. Agric. and Hort. Res. Stat.*, 1927.

A general survey has been made of the trial orchards of cider and perry varieties established over a wide area in the West of England during the years 1908-1913, with trees raised at Long Ashton. The varieties under trial were mainly those which had given promising results in cider-making

trials at the Institute and were placed under test to ascertain their value as orchard trees under widely different conditions. A tabular summary of results is given, which indicates the degree of variation in behaviour in the respective trial orchards.

BARKER (B. T. P.). The Relations of Scion and Rootstock. I. Tree Size in Relation to Scion and Rootstock. (a) The Case of Young Trees. *Ann. Rep. Agric. & Hort. Res. Stat.* 1927.

The immediate object of the investigation was to determine whether or not the size of budded or grafted trees is in direct ratio with the vigour of growth of the kinds of rootstocks used. The apple was the kind of tree selected for the tests, three varieties, each readily capable of vegetative propagation on their own roots, being utilised. These represented three distinct grades of growth vigour, one (A) being very vigorous, another (B) very weak, and the third (C) intermediate. Twelve comparable sets of trees were raised, viz.,

1, 2 and 3. A, B, and C, respectively, unworked, on their own roots.

4, 5, and 6. A worked, respectively, on A, B, and C as rootstocks.

7, 8, and 9. B worked, respectively, on A, B, and C as rootstocks.

10, 11, and 12. C worked, respectively, on A, B, and C as rootstocks.

The results show, firstly, that the unworked tree, on its own roots, is normally somewhat stronger than a worked tree of the same variety, when the rootstock used is also of that variety. The presence of a graft union thus imposes some check to growth in the early life of the tree.

Secondly, in the cases where the scion variety is different from that of the rootstock, the size of the tree is determined as follows : If the growth vigour of the scion variety is greater than that of the rootstock variety, a dwarfing effect occurs, its extent corresponding with the degree of difference of growth vigour between the scion and rootstock varieties. If the growth vigour of the scion variety is less than that of the rootstock variety, the size of the tree is approximately that of the scion variety when worked on itself as rootstock and there is accordingly no support for the view that a weak scion variety can be strengthened by being worked on a strong rootstock.

MAYNARD (J. G.). Investigations on Gooseberry and Red Currant Varieties. *Ann. Rep. Agric. & Hort. Res. Stat.*, 1927.

Gooseberries.

Samples of 43 named varieties purchased from commercial sources were found to contain about 70 different kinds. This serves to indicate the impurity of general commercial stocks. Moreover there apparently exists uncertainty as to nomenclature.

These points illustrate the necessity of investigation and the working up and testing of pure lines of varieties.

Red Currants.

The position is more or less similar to that of the gooseberry.

SWARBRICK (T.). Some Preliminary Observations upon the Influence of Scion Variety upon the Root Growth of Young Apple Trees. *Ann. Rep. Agric. & Hort. Res. Stat.*, 1927, pp. 42-49. (Also in *Journ. Bath & West*, 1927.)

This paper deals mostly with observations upon American bench grafted trees worked upon miscellaneous seedlings. Under these conditions there appears a marked influence of scion upon root character. Some varieties have coarse unbranched roots, others much branched fibrous ones. The uniformity of root type within a variety is most marked. Similar varieties

when budded upon seedling stocks have very variable root systems. It is concluded that the stem piece of a stock is the major factor in the complex root stock and scion influence. It is possible that tree variation may be largely eliminated by eliminating the stem part of seedlings when grafting or budding. It is clear that the problems raised by the use of seedling rootstocks have not been given the systematic attention they deserve. A case is cited where out of 1,000 healthy trees 900 came into bearing the fifth year from planting. These were all bench grafted trees worked upon miscellaneous seedling root pieces.

SWARBRICK (T.). **Some Observations upon Ringing Fruit Trees to Increase Production.** *Ann. Rep. Agric. & Hort. Res. Stat.*, 1927, pp. 50-56.

The practice of ringing is increasing in this country. It is a most effective method of bringing vigorous over vegetative trees into bearing. Weak growing trees should not be ringed. There is no danger from the loss of trees or branches if the ringing be properly carried out. As many as 12,000 apple trees have been ringed without the loss of a single limb. The rings should be as narrow as the thickness of the bark permits and must be made within fourteen days after the blossoms fall. If the weather is very hot the rings may be covered over with adhesive tape to prevent excessive drying out. Ringing before May often results in the death of the part above the ring.

SWARBRICK (T.). **Studies in the Physiology of Fruit Trees. II. The Effects of Ringing, Double Ringing, and Dis-budding upon the Starch Content and Cambial Activity of Two Year Old Apple Shoots.** *Journ. Pom. Hort. Sci.*, Feb., 1928, vol. vi, pp. 296-312.

These observations continue those previously reported. The normal growth principles are sought out so that such practices as pruning and manuring may be put upon a scientific rather than an empirical basis. Developing buds play an important part in initiating cambial activity in woody stems. The slowing down of elongation growth of stems is accompanied by a marked starch accumulation in the stems. Phloem and cambial continuity appear to be essential for the co-ordinated and continuous physiological activity of woody stems. Double ringed stems showed all the phenomena of physiological isolation in the parts between the rings. The observations made have considerable bearing upon vegetative propagation, grafting, budding and pruning. Tree growth portrays the internal conditions prevailing. By growth studies it becomes more and more possible to diagnose internal conditions.

SWARBRICK (T.). **Factors Governing Fruit Bud Formation. VIII. —The Seasonal Elongation Growth of Apple Varieties on some Vegetative Root Stocks, and its Possible Relation to Fruit Bud Formation.** *Journ. Pom. Hort. Sci.*, July, 1928, vol. vii, pp. 100-129.

This paper is the continuation of previous studies made at Long Ashton by several workers. Varieties possess individuality which may be correlated with their fruiting habits. Conditions most conducive to flower bud formation appear to be those which prevent excessive amounts of elongation growth and cause its cessation early in the season. This is actually the case with ringed trees and is also produced by using certain rootstocks. To obtain the kind of growth most desirable it will be necessary to adopt certain cultural methods, which will of necessity vary with locality. In some localities a cover crop system is probably most desirable. The immediate condition governing flower bud formation is probably a

relation of soluble carbohydrates to nitrogen in the tissues of the apple branch, present some time previous to that at which the flower buds can be distinguished as such.

WALLACE (T.). **Leaf Scorch on Fruit Trees.** *Journ. Pom. Hort. Sci.*, Feb., 1928, vol. vi, No. 4; *Journ. Pom. Hort. Sci.*, July, 1928, vol. vii, Nos. 1 & 2.

An account is given of extensive investigations on Leaf Scorch. The work falls into three groups: (a) pot experiments with fruit trees in sand culture; (b) soil investigations; (c) field experiments on methods of controlling leaf scorch.

Under (a) it is shown that leaf scorch is the general symptom shown by potash deficient plants. Potash deficiency is related to nitrogen supply, and "scorch" can be eliminated from trees in pot culture by ensuring a satisfactory $\frac{N}{K}$ ratio. Scorch was also controlled in potash deficient plants

by spraying the foliage with sulphate of potash at 1 per cent. strength, and was induced by waterlogging plants receiving adequate potash supplies.

Soil investigations showed that "scorching" soils could be grouped into three categories: (a) light soils of poor water-holding capacities and low potash supplies; (b) close-textured silty soils with relatively unweathered impervious subsoils and subject to rapid drying out and periodic waterlogging; (c) clay soils with defective drainage.

In all these cases the soils showed unfavourable conditions of water supply.

In experiments on the control of leaf scorch it was shown that potash manures were usually effective where waterlogging was not a potent factor; "grassing down" will also tend to mitigate scorching by lowering the nitrogen supply to the tree.

The relation of classes of fruit, varieties, rootstocks, etc., to the incidence of leaf scorch is discussed. It is considered that the evidence supports the view that leaf scorch results from unsatisfactory conditions of water supply within the plant.

RESEARCH INSTITUTE IN PLANT PHYSIOLOGY, IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY, LONDON.

ASHBY (E.), BOLAS (B. D.), & HENDERSON (F. Y.). **The Interraction of Factors in the Growth of *Lemna*.** *Ann. Bot.*, 1928, vol. xlii.

A technique is described whereby *Lemna* can be grown in a large volume of culture solution in continuous circulation and kept under constant conditions of temperature, light, and aeration. Methods are given for determining the increase in surface area, dry weight increase, and increase of carbon content, and the errors for such observations determined; they are a little over 2 per cent. for the mean of two observations. A few illustrative results are given showing how regular is the growth under the experimental conditions.

BOLAS (B. D.), and HENDERSON (F. Y.). **The Effect of Increased Atmospheric Carbon Dioxide on the Growth of Plants. I.** *Ann. Bot.*, 1928, vol. xlii.

The relative merits of closed and open systems for the culture of plants under conditions of carbon dioxide enrichment are discussed and the open system is considered in all respects superior. An apparatus of the open type is described in which cucumber plants (*Cucumis sativa*) were grown. An increase of size is evident in a few days, and after 14 days increases in dry weight of 125 per cent. have been observed. A greater richness in chlorophyll has also been observed as an effect of increased carbon dioxide.

EVANS (D. I.). **A Study of the Sugars of Apples with Special Reference to the Fructose Glucose Ratio.** *Ann. Bot.*, 1928, vol. xlii.

The methods of estimating sugars have been studied and also the application of these methods to the investigation of the sugars of the apple. The acid and sugar content of various apples have been determined; the difference of sugar content of the same apple grown on different soils is almost as great as that between varieties on the same soil. Apples contain 2-3 times as much fructose as glucose; in Bramley's Seedling the fructose-glucose ratio is equal to the sucrose-acid ratio, and both these ratios decrease as the nitrogen decreases.

GREGORY (F. G.). **The Analysis of Growth Curves.** *Ann. Bot.*, 1928, vol. xlii.

A consideration of the interpretation of these curves and a reply to criticism.

GREGORY (F. G.). **The Effect of Temperature on Increase in Area of Leaf Surface and in Dry Weight of *Cucumis sativa*.** *Ann. Bot.*, 1928, vol. xlii.

Cucumbers were grown under constant conditions of light (continuous) and humidity at five different temperatures, the lowest and highest being 17.2° C. (63° F.) and 32.4° C. (90.3° F.). Curves of leaf-area increase were constructed and dry weight determinations made. The curves for cotyledon area vary in form, according to the temperature level, from simple decrement curves to nearly symmetrical sigmoid curves. The curves for area of foliage leaves conform to a simple parabolic function. A hypothesis is put forward to account for the observed results.

HAYNES (D.), & BROWN (J. M.). **A Method for the Determination of the Salt Content from the pH Value of Apple Juice and some Comparative Analyses of the Mineral Content of the Juice and of the Whole Apple.** *Biochem. Journ.*, 1928, vol. xxii.

It is shown that if the pH and the titrable acidity of the juice of the apple is measured it is possible to obtain a fairly trustworthy estimation of its salt content by comparison with known mixtures of malic acid and potassium malate. Most of the potash of the apple appears to be present in the cell sap.

WELSH PLANT BREEDING STATION, ABERYSTWYTH.

TINCKER (M. A. H.). **The Effect of Length of Day Upon the Growth and Chemical Composition of the Tissues of Certain Economic Plants.** *Ann. Bot.*, Jan., 1928, vol. xlii, No. clxv, p. 101.

The experimental work reported in this paper forms a continuation of that described in *Annals of Botany*, vol. xxxix, No. clvi, p. 721, October, 1925.

Further species were subjected to curtailed periods of daylight. Both the effect of subjecting plants to this treatment at different stages of growth and the "after effect" upon subsequent growth under normal conditions of light were observed.

The major part of the paper deals with quantitative results obtained from dry-weight estimations and other measurements of growth, and from chemical analyses of the tissues of cultures of graminaceous, tuber-bearing, and leguminous plants. From the data it is concluded that the curtailed periods of light not only control the growth-habit, but modify the utilization and distribution of the food products manufactured.

A brief consideration of the ratio of the carbohydrate to nitrogenous compounds present in the tissues in its relation to the behaviour of the plant concludes this paper.

(3) PLANT BREEDING, CROPS, SEEDS, WEEDS.

NATIONAL INSTITUTE OF AGRICULTURAL BOTANY, CAMBRIDGE.

ARMSTRONG (S. F.). **Yield Trials of Autumn Sown Wheats, 1925-1926.**
Journ. N.I.A.B., 1928, vol. ii, No. 1. 4 pp.

An interim report on trials forming part of a series extending from 1924 to 1928 of the varieties Squarehead's Master (Control), Iron III, Little Joss, Yeoman II, Fox, Wilhelmina, Cambridge Browick and Weibull's Standard, at Cambridge and five sub-stations in other parts of England. Tables of the yield results and the values per acre at each station are given with a brief commentary.

ARMSTRONG (S. F.). **Yield Trials of Spring-Sown Barleys, 1926.**
Journ. N.I.A.B., 1928, vol. ii, No. 1. 7 pp.

An interim report on trials forming part of a series extending from 1925 to 1928 of the varieties Plumage-Archer 1924 (Control), Archer-Goldthorpe, Spratt-Archer, Webb's Sunrise, Beaven's Archer and three unnamed varieties, Nos. 824, 825, and Beaven's 25, at Cambridge and five sub-stations in other parts of England. Tables of yield results and values per acre are given with a brief commentary, and a report from the Institute of Brewing on the quality of the barleys and the malts made therefrom is included.

HAWKES (F. C.). **Winter Wheat, Barley and Oats Trials, 1924-27.**
Journ. Min. Agric., Dec., 1927, vol. xxxiv, No. 9. 4 pp.

A summary of the results of yield trials carried out for three successive seasons at six trial centres with 9 varieties of winter wheat, 6 oats, and 6 barley, together with notes on their field behaviour and the quality of the grain.

HUMPHRIES (A. E.), CLOVER (J. PERCY), & HUTCHINSON (ROBT.).
Quality of Wheats from the 1925-26 Trials of the National Institute of Agricultural Botany. *Journ. N.I.A.B.*, 1928, vol. ii, No. 1. 10 pp.

An interim report on tests by the Home-Grown Wheat Committee of the quality for breadmaking purposes of the wheats from the yield trials described in the preceding report. The water content, water soluble extract, gluten content, the milling and baking results are given in detail and discussed, and there is an appreciation of each variety. An appendix describes a new and reliable means known as the "Saunders Test" for estimating the "strength" of flour.

PARKER (W. H.). **Yield and Maturity Trials of Main Crop Potatoes, 1926.** *Journ. N.I.A.B.*, 1928, vol. ii, No. 1. 13 pp.

An interim report on trials forming part of a series extending from 1925 to 1928 of the varieties Ally, King Edward, The Bishop, Tinwald Perfection, Majestic, Field Marshal, Arran Consul, McGill & Smith's 8215, Up-to-date, Arran Chief, Kerr's Pink, Rhoderick Dhu and Golden Wonder, at Ormskirk, Kirton and Truro. Tables are given showing the times taken to mature, the total yields and the ware yields at each place and these results and such features as the incidence of disease and the relation of yield to maturity are discussed.

PARKER (W. H.). **Trials of Some New Early Varieties of Potatoes.** 1927. *Journ. N.I.A.B.*, 1928, vol. ii, No. 1. 5 pp.

A report on ordinary yield and maturity trials of two new varieties, Herald and Big Ben, against Epicure and Ally, at Ormskirk and Kirton, together with a report on a new method of testing the value of early varieties, described as "early bulking trials," which was carried out at Ormskirk only and dealt with the varieties Herald, Big Ben, MacKelvie's 520 (Arran Crest), Epicure and Ninetyfold.

Lord Derby **Gold Medal Potato Trials, 1927.** *Journ. N.I.A.B.*, 1928, vol. ii, No. 1. 6 pp.

A report from the Lord Derby Gold Medal Award Committee on trials at Ormskirk in 1927 of eleven new immune varieties, Aberdeen Favourite, Argyll Favourite, Arran Banner, Claymore, Doon Star, Duke of Perth, Incomer, Macbeth's Castle, The Baron, The Bounty and The Boxer, against the standard varieties Great Scot, Majestic, Kerr's Pink and Ally. The report deals with the yield and maturity of the varieties, their purity and freedom from disease and announces that as a result of the trials a Gold Medal was awarded to Arran Banner.

Report of the Potato Synonym Committee, 1927. *Journ. N.I.A.B.*, 1928, vol. ii, No. 1. 7 pp.

The Committee, of which Dr. R. N. Salaman is Chairman, report upon the identity of the potatoes entered for the 1927 Wart Disease Immunity Trials at the Potato Testing Station, Ormskirk, Lancs, and record the proportion of synonyms found among these entries, and the prominence of synonyms in seedsmen's catalogues. Reference is made to the behaviour of the wild *Solanum utile* as regards immunity from wart disease. There are tables of the synonyms, grouped under their types and of distinct varieties free from and susceptible to wart disease. There is also a table of numerous stocks purchased from seedsmen and grown at Ormskirk in 1927 beside the standard varieties of which the former were believed to be synonyms.

EASTHAM (ALFRED). **Tenth Annual Report of the Official Seed Testing Station for England and Wales.** *Journ. N.I.A.B.*, 1928, vol. ii, No. 1. 15 pp.

A review of the work carried out by the Seed Testing Station between August, 1926, and July, 1927. Tables show the number of samples received and distribution according to species, the germination and incidence of seed borne diseases in cereals, the distribution of cereal samples according to variety, the germination of pulses, and root and vegetable crops, purity and germination of grasses and clovers, and the occurrence of dodder in clover samples. The principal features of these figures are discussed and compared with the results of previous years. An appendix to the report reproduces the papers set in the seed testing examination held at the Station in July, 1927.

EASTHAM (ALFRED). **Some Technical Aspects of Seed Testing.** *Journ. N.I.A.B.*, 1928, vol. ii, No. 1. 4 pp.

This paper deals with the improvement of the technique of seed testing and its dependence on concurrent research as regards both purity and particularly germination tests. Reference is made to the use of low temperatures for promoting germination of cereals and brassica species, and there is a summary of recent work of the Official Seed Testing Station on

the longevity of seeds and the causes affecting the loss of vitality in storage, and on seed borne diseases. The paper concludes with notes on the interpretation of purity and germination reports.

MILN (The late G. P.). **The Trade Aspect of Seed Testing.** *Journ. N.I.A.B.* 1928, vol. ii, No. 1. 5 pp.

This paper, read at the Sixth Annual General Meeting of the Fellows of the Institute, December, 1927, describes the early practice of the seed trade with regard to seed testing, the improvement in private stations due to the establishment of the Official Station, the mutual advantages derived from intercourse between official and private stations, and the value and effects of the Seeds Act from the point of view of a seed merchant. The paper concludes with an expression of the view that seed merchants should be qualified by examination in the science of agricultural botany.

MONRO (A. W.). **Seed Control in the United Kingdom.** *Journ. N.I.A.B.* 1928, vol. ii, No. 1. 6 pp.

This paper, read at the Sixth Annual General Meeting of the Fellows of the Institute, December, 1927, reviews the origins and development of seed control and seed testing, and the establishment of seed testing stations. It summarises the purpose and effect of recent legislation, describes the administration of the Seeds Act, and the licensing and control of private testing stations. It discusses difficulties such as farmer to farmer sales, the packet seed trade, and side line sales, and it concludes by describing the benefits that have sprung from these activities.

JOHN INNES HORTICULTURAL INSTITUTION.

BUXTON (H. C.) & NEWTON (W. C. F.). **Hybrids of *Digitalis ambigua* and *Digitalis purpurea*, their fertility and cytology.** *Journ. Genet.*, 1928, vol. xix, pt. 3, pp. 269-279, 2 plates (1 coloured) and 2 t.f.

Hybrids were raised from *D. purpurea* ♀ × *D. ambigua* ♂. Two plants only of 43 raised showed a limited degree of fertility and these gave rise in the F₂ generation to fertile seedlings which proved to be tetraploids. The tetraploids were intermediate in character between the original parents, like the F₁ hybrids, but were larger in size. Some triploids were produced by open pollination of the fertile F₁ hybrids.

CHITTENDEN (R. J.). **Notes on species crosses in *Primula*, *Godetia*, *Nemophila* and *Phacelia*.** *Journ. Genet.*, 1928, vol. xix, pt. 3, pp. 285-314, 2 plates and 5 t.f.

Records the inheritance of crosses between *Primula acaulis* × *Juliae*, and *P. elatior* × *Juliae*.

Godetia amoena and *G. Whitneyi* will intercross. Both have seven chromosomes haploid. These species will not cross with *G. Bottae* (n=9), *G. tenella* (n=16) and *G. lepida* (n=16), though *G. Bottae* will cross with *G. tenella*, and *G. tenella* with *G. lepida*. All the hybrids were highly sterile.

Six species were examined in *Nemophila*. All had a haploid number n=9 and were completely inter-sterile.

CHITTENDEN (R. J.). **Note on an Abnormal *Antirrhinum*.** *Journ. Genet.*, 1928, vol. xix, pt. 3, pp. 281-283, 1 t.f.

CHITTENDEN (R. J.). **Ever-sporting races of *Myosotis***. *Journ. Genet.*, 1928, vol. xx, pt. 1, pp. 123-129, 2 t.f.

Striped varieties of *Myosotis* are described which cannot be bred true from seed. The somatic behaviour is strongly suggestive of a chimerical structure.

CRANE (M. B.) & DARLINGTON (C. D.). **The Origin of New Forms in *Rubus*, I.** *Genetica*, 1927, vol. ix (appeared 1928), pp. 241-278, 32 t.f.

Describes the results of hybridisation experiments in which various forms of Blackberry, Raspberry, and the Commercial Loganberry, Laxtonberry, Lowberry, Veitchberry, Himalaya berry and the Mahdi were employed. The chromosome number of all the material was determined. They vary from diploids ($2n=14$) up to heptaploids ($7n=49$), *i.e.*, the Laxtonberry and the Himalaya berry. The Loganberry is a hexaploid and is probably a hybrid blackberry-raspberry. A family of tetraploid blackberry seedlings is described, arising from a cross between a diploid and a tetraploid. A certain number of this family are devoid of prickles, a character derived from one of the original parents.

DARLINGTON (C. D.). **Studies in *Prunus*, I and II.** *Journ. Genet.*, 1928, vol. xix, pt. 2, pp. 213-256, 8 plates and 25 t.f.

The paper records cytological studies of species and varieties of *Prunus*. The basic chromosome number is 8. Diploid, tetraploid and hexaploid species exist.

The edible Sweet Cherries are aneuploid, and possess one, two or three chromosomes beyond the diploid number. This has a bearing upon the incompatible groups of self-sterile Sweet Cherries. The Sour and the Duke Cherries are tetraploids, the Dukes being essentially aberrant doubled segregates of Sweet Cherries. With tetraploidy the bar to self fertility is removed. The cytological studies lead to a discussion of the history, origin and morphological relations of the domesticated cherries.

HUSKINS (C. L.). **The Cytology of Speltoid Wheats in Relation to their Origin and Genetic Behaviour.** *Journ. Genet.*, 1928, vol. xx, pt. 1, pp. 103-122, 38 t.f.

Three types of heterozygous speltoid wheats obtained from Svalöf were studied and found to possess respectively 42, 41 and 43 chromosomes. Each type had characteristic abnormal chromosome behaviour. It is concluded that speltoids commonly arise from normal wheat through chromosome aberrations, and that the different ratio types are determined primarily by differences in chromosome number.

PELLEW (C.). **Further Data on the Genetics of Rogues among Culinary Peas (*Pisum sativum*)**. *Z. indukt. Abstamm. u. Vererb. Lehre Suppltd.*, 1928, vol. ii, pp. 1157-1181, 2 t.f.

The paper records the results of further backcrosses with rogues, and also the appearance of a new form with exceptionally narrow foliage. This came in the F_2 from a cross between Early Giant type and Sugar Pea rogue, and is due to a factor recessive to the normal and linked with those for colour and early flowering.

DE WINTON (D.). **Further Linkage Work in *Pisum sativum* and *Primula sinensis*.** *Z. indukt. Abstamm. u. Vererb. Lehre Suppltd.*, 1928, vol. ii, pp. 1594-1600.

Records the results of backcrosses from which the percentage of crossovers in certain linkages can be calculated.

LONG ASHTON FRUIT RESEARCH STATION.

HUTCHINSON (H. P.). **The Raising of Basket Willows from Seed.** *Ann. Rep. Agric. & Hort. Res. Stat.*

In commercial practice the basket willow is always propagated vegetatively by means of sets. "New Varieties" have arisen as "Sports," but hybrids of species exist. The chief object in view in raising varieties from seed is to introduce better varieties to the basket-making industry.

Various technical methods adopted in raising seedlings are described. The most satisfactory is to sow fresh seed on the surface of fine soil in seed boxes. Satisfactory moisture conditions are secured by placing the seed boxes in trays containing water. The shading of young plants from the direct sunlight is essential.

The characters of young willow seedlings are described.

SPINKS (G. T.). **Progress Report on Fruit Breeding.** *Ann. Rep. Agric. & Hort. Res. Stat.*, 1927.

Fruit was obtained from about 350 individual apple seedlings, and several of these appear to be of some value as dessert apples, though some are very late keepers. A few seedling pears fruited for the first time, the fruit of one being of distinctly good quality. Several seedling plums of the 24 which fruited will be propagated for a further trial.

Records were taken from a small trial plot of selected seedling varieties of blackcurrant and several of the varieties are worthy of further trial.

Crosses made during the year have been confined to apples and strawberries. Several English varieties of dessert apple have been crossed with Mackintosh Red, and among strawberries several varieties, such as Tardive de Leopold, which are resistant to aphid attack, have been crossed with susceptible varieties of higher quality.

PLANT BREEDING INSTITUTE, CAMBRIDGE.

DOUGHTY (L. R.) & ENGLEADOW (F. L.). **Investigations on Yield in Cereals. V. A Study of Four Fields of Wheat: the Limiting Effect of Population Density on Yield and an Analytical Comparison of Yields.** *Journ. Agric. Sci.*, 1928, vol. xviii, pt. 2.

Fluctuation in population density with its influence on development at all stages and on final yield, was studied on four wheat fields—one good, two medium, and one bad. On all four—but especially on the bad field—marked loss of crop was shown to result from thinness of plant. Thinness implies, not an average value, but gaps and paucity of plants on a great number of small areas scattered at random over the field. A "critical period" in crop life was shown to occur about the end of March. Limitations to yield in field crops and the optimum application of nitrogenous top-dressings, are intimately connected with this critical period.

ENGLEADOW (F. L.). **The Distensometer: an Aid to the Determination of Baking Quality of Flour.** *Cereal Chem.*, 1928.

A flour is tested by comparing its "distensibility" with that of a standard flour, the two doughs being prepared in the same way and at the same time. Distensibility implies capacity of a sheet of dough to stretch under air pressure. It has been found to be a useful index to baking quality, especially for biscuit flours. The apparatus is simple and inexpensive and tests can be made on small quantities (e.g. 80 grammes) of flour.

ENGLEDOW (F. L.). **Investigations on Yield in Cereals. IV. The Action of the Seed Drill.** *Journ. Agric. Sci.*, 1928, vol. xviii, pt. 1.

Great irregularity in distribution of plants along the rows in typical cornfields, demonstrated in previous work, was very fully confirmed. An analysis of the form of irregularity made clear that defective drill action was primarily responsible. Confirmation of this conclusion and identification of the chief mechanical defects of the drill were also established by means of a mechanical analysis of drill action (when working under ideal conditions).

SALAMAN (R. N.). **Abnormal Segregation in Families arising from the Cross *Solanum utile* × *Solanum tuberosum*.** *Z. Indukt. Abstamm. u. Vererb. Lehre Supptbd.*, 1928.

An account of a larger work appearing in the *Journ. Genet.*, describing the abnormal segregation resulting from the cross *Solanum utile* by domestic potato. Noteworthy is the appearance in subsequent generations of entire families indistinguishable from the original *S. utile*.

A somatic mutation involving almost all characters of the plant in the F_4 generation is recorded.

Cytologically, plants with haploid chromosomes over 30 resemble *S. utile*: below that, they tend to resemble the domestic. Whilst the *S. utile* segregates out in morphological completeness, its physiological characters may segregate independently.

SALAMAN (R. N.). **The Inheritance of Cropping in the Potato.** *Z. Indukt. Abstamm. u. Vererb. Lehre Supptbd.*, 1928.

The inheritance of yield studied is not that of the individual plant, but its capacity to convey the faculty for yielding to its offspring. A special method of estimating cropping was devised. It is shown that in the domestic potato there are at least two pairs of factors controlling yield, and that it is possible to breed varieties true to high or low cropping.

A study of the cropping-capacity as observed in the crosses between the wild and domestic potato, suggests that the latter may have been derived from the former by the loss of factors inhibiting crop.

WATKINS (A. E.). **Genetic and Cytological Studies in Wheat. IV.** *Journ. Genet.*, vol. xix, p. 87.

The paper gives an account of the general method by which characters are inherited in crosses between Rivet wheats and *T. vulgare* wheats.

WATKINS (A. E.). **The Genetics of Wheat Species Crosses. I.** *Journ. Genet.*, vol. xx, p. 1.

A general explanation is put forward of the appearance of new types, particularly types resembling other species, when species of the Emmer group are crossed with species of the *T. vulgare* group.

RESEARCH INSTITUTE IN PLANT PHYSIOLOGY, IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY, LONDON.

GREGORY (F. G.) & CROWTHER (F.). **A Study of the Comparative Yields of Barley Varieties with Different Manurings.** *Ann. Bot.*, 1928, vol. xlii.

Five varieties of barley were grown with eleven different types of manuring, seven replicates of each variety for each manuring being employed. The types of manuring included deficiency of nitrogen, of phosphate, and of potash.

Significant differences were obtained for straw, roots, total tops and grand total. The differences between the response of the varieties in the potash-deficient series were so great as to be visible a month after germination. The results indicate the possibility of breeding directly for efficiency in the use of manure and for the raising of varieties suited to soils known to be deficient in some essential constituent.

BLACKMAN (V. H.). **The Treatment of Cotton Seed by Sulphuric Acid.** *Emp. Cott. Grow. Rev.*, 1928.

The physiological effect of the treatment of cotton seed with concentrated sulphuric acid was investigated. An exposure to the acid of 20 to 30 minutes, followed by washing in several changes of water for 20 minutes, can safely be used for delinting and for surface sterilisation of the seed. The germination capacity remains unimpaired whether one is dealing with a good sample or one with as low a germination as 5 or 10 per cent.

ROTHAMSTED EXPERIMENTAL STATION.

BISHOP (L. R.). **The Composition and Quantitative Estimation of Barley Proteins.** *Journ. Inst. Brewing*, 1928, vol. xxxiv, p. 101.

Methods have been worked out for the quantitative estimation of the amounts of the separate proteins in barley grain and applied to samples of Plumage Archer grown under varied conditions of season, soil and manuring. There are regular changes in the relative amounts of the individual proteins with increasing total protein content of the grain.

WELSH PLANT BREEDING STATION, ABERYSTWYTH.

JONES (MARTIN G.). **Choice of Seed Corn with Particular Reference to Oats in Hilly Districts.** *Journ. Min. Agric.*, Sept., 1928, vol. xxxv, No. 6, p. 541.

In this article attention is drawn to the large number of new varieties offered to the farmer and hence the need for a careful choice. The most important consideration is that of the *type* (or *general character*) of the plant. On the most fertile land the "heavy grained" types are the most profitable (these being generally poor in tillering and early in ripening), whereas on poor land in exposed situations varieties with a high tillering capacity give the best returns even though they are late in ripening. Having decided which variety to grow the next step is to procure plump, well-matured seed: here the lowland farmers, being more favourably situated for seed-growing, could render much assistance to the upland farmers by undertaking to grow a supply of seed of *pure strains* suitable for the hill farms.

SAMPSON (K.) & DAVIES (D. WALTERS). **The Germination and Early Growth of Wheat Treated with Copper Carbonate and Tillantin R.** *Ann. App. Biol.*, Aug., 1928, vol. xv, No. 3, p. 408.

A review is given of recent literature from which the authors conclude that the supposed "stimulating effect" of such substances as uspulun, tillantin and copper carbonate is, in most cases, clearly to be attributed to the fungicidal properties of these compounds.

Critical experiments were conducted with several varieties of wheat to test the influence of copper carbonate and tillantin R. on seed from which disease-producing organisms were as far as possible eliminated.

The authors consider that the results gave no definite evidence of "stimulation."

TINCKER (M. A. H.) & JONES (M. G.). **Yield Studies in Oats. II. The Relationship between the Characteristics of a Seed Sample—Its Germination and Field Establishment—and the Early Growth of the Subsequent Plants.** *Ann. App. Biol.*, Nov., 1927, vol. xiv, No. 4, p. 400.

A series of correlation studies were carried out between the seed characteristics and data dealing with the early growth of a number of Record Oat samples. Generally the total germination figures in a germination test in sand were correlated with field establishment, but within the narrow germination range 85–100 per cent. no correlation with establishment was found. The amount of available food in the seed as measured by the average dry weight of the caryopses influenced the size and weight of the seedlings produced. The moisture content of the grain was negatively correlated with rate of germination indicating that samples stored with a high water content did not germinate well, but the percentage husk bore no relation to germination.

Ten weeks after sowing the mass of the plants obtained from a given sowing depended primarily upon the number of plants established. Although tillering was well advanced plants possessing additional space did not compensate for low establishment figures by increased growth at this stage of their development.

When the grain was heated for 15 minutes at 75°C those samples containing a high moisture content suffered more than well-dried samples. Indications were also obtained that the following type of sample was particularly susceptible to injury by artificial heating: (a) a rapidly germinating sample, (b) a thin husked sample, (c) a sample with heavy grain.

FAGAN (T. W.) & WATKIN (J. E.). **The Chemical Composition of Mangolds grown in Mid Wales.** *Welsh Journ. Agric.*, 1928, vol. iv, page 102;

The average percentage of dry matter found in the mangolds grown in this area is considerably lower than that generally quoted. As the feeding value of roots depends upon the percentage of dry matter and its composition, the yield per acre is not a satisfactory guide to the feeding value of the crop. These results indicate that time of sowing may influence the percentage of dry matter as well as its composition. The application of nitrogenous manures increased the percentage of protein in the dry matter, though ammonium chloride reduced the percentage of dry matter and sugar in both seasons as did also the heavy dressing of ammonium sulphate. The effect of potash appears to be to narrow the ratio of true to crude protein suggesting that it causes the roots to mature earlier. Storage until spring results in a lowered dry matter and sugar content, but the percentage of true protein in the dry matter has greatly increased. "Bolting" reduces the dry matter and sugar content of the mangold; the reduction on the average in the percentage of sugar amounts to about 29 per cent. of that originally present.

SCOTTISH SOCIETY FOR RESEARCH IN PLANT BREEDING.

DIRECTOR OF RESEARCH. **The Scottish Plant-Breeding Station: Its Work and Objects.** *Ann. Rep. yr. ended 31st Mar.*, 1928.

DAVEY (V. McMASTER). **Breeding of Swedes and Turnips.** *Scott. Journ. Agric.*, 1928, vol. ii, No. 1.

The results of mass selection and the possibilities of obtaining pure lines in these species by self-fertilisation are discussed, and the progress of experiments in the latter method at the Plant Breeding Station is indicated.

SEED TESTING AND PLANT REGISTRATION STATION, CORSTORPHINE.

~~LANDER (A.), BERRY (R. A.) & HENDRICK (J.).~~ **Analysis of Varieties of Oats.** *B.O.A.S. Misc. Pub.*, No. 8.

Observations have been made on the varieties within the groups of the cultivated oats allied respectively to the varieties Abundance, Potato, Sandy and Tam Finlay. Approximately fifty varieties of the Potato Oat have been isolated.

HARPER ADAMS AGRICULTURAL COLLEGE, NEWPORT, SALOP.

DAVIES (W. MORLEY). **Experiments in the Cultivation of the Sugar Beet Crop in the West Midlands during 1927.** *Journ. Agric. Res.*, Sept., 1928, vol. xviii.

The paper refers to one year's results. On fields where there is no tendency to form hard lower layers the necessity for sub-soiling is not apparent. Returns for sugar beet on the ridge show a distinct advantage over those for beet grown on the flat. The evidence shows a decided advantage in favour of narrow spacing of the rows. This was corroborated by external evidence from the data derived from County Experiments in the Province. It seems that expectation of high yields can only be justified by using a 16 in. or 18 in. spacing. The results suggest that width of hoe is of less importance than width of row. (This needs further investigation and will be tested out in 1928). There is a marked relationship between returns per acre and the tonnage. Under the present type of contract existing with the factories it seems that the all important aim of the agriculturist should be to produce a heavy tonnage and leave the sugar content to take care of itself.

UNIVERSITY COLLEGE OF NORTH WALES.

ROBERTS (R. ALUN). **The Significance of Variety in Oats with respect to Yield and other ancillary characters under North Wales conditions.** *Welsh Journ. Agric.*, 1928, vol. iv, pp. 157-170.

Fifty-six varieties of Oats have been tested, most of them for many years in succession. Victory and Record have clearly proved the most suitable white oats for lowland conditions in North Wales. The latter stands best and is to be preferred where there is fear of lodging. King, Crown and Wide Awake have also done well but are slightly inferior to Victory and Record. For hill conditions where yellow and black oats are still favoured, Golden Rain is recommended in preference to Goldfinder, and Bountiful in preference to Black Tartarian. Other factors discussed are straw yields, effect of change of seed, proportion of kernel to husk, strength of straw and earliness of ripening.

ROBERTS (R. ALUN). **Correlation of Yield in Oats with Meteorological Observations at the University College Farm, Bangor, for the period 1903-1926.** *Journ. Agric. Sci.*, Apr., 1928, vol. xviii, pt. 2, pp. 297-316.

The existence of two critical periods for Oats within the growing season, the one for the 20 days after the emergence of the plants in spring and the other for the 14 days covering the emergence of the panicles, has been shown. The net correlation coefficients for rainfall and yield, and for accumulated temperatures (above zero of 42°F.) and yield worked out as follows:—

For first period $r = -0.299 \pm 0.153$ for rainfall and yield.

For first period $r = +0.287 \pm 0.189$ for accumulated temperatures and yield.

For second period $r = + 0.841 \pm 0.051$ for rainfall and yield.

For second period $r = - 0.523 \pm 0.109$ for accumulated temperatures and yield.

WHITEHEAD (T.) & MORRIS (O. R.). **Field Trials with Welsh Seed Potatoes.** *Welsh Journ. Agric.*, 1928, vol. iv.

An account is given of experiments designed to test the value, as seed, of certain stocks of Welsh potatoes which had been grown for a number of years without change of seed.

Three varieties (Kerr's Pink, Great Scot and Arran Chief) were used and the trials were arranged in the form of chequer-boards with unit rows of sixty tubers. The unit rows were, in most cases, replicated seven times and significance was only attached to differences of yield amounting to three times the probable error of the difference of the means.

As regards cropping power, the Welsh seed was as good, in several instances, as new Scotch seed, and two stocks gave heavier total yields than the latter. With the exception of one Welsh Stock, all gave at least as high a proportion of ware and ware plus seed as did the similarly treated Scotch seed.

The total percentage of virus infection in some of the Welsh stocks was distinctly greater than in the new Scotch seed. Most of this disease, however, consisted of common mosaic, which had little or no effect on the yields. Having regard to the length of time (fourteen years in the case of one of the best of the stocks) during which the Welsh seed had been grown, without supervision or inspection, the opinion is expressed that the trials show the possibility of good seed potatoes being produced in selected localities in North Wales.

EDINBURGH AND EAST OF SCOTLAND COLLEGE OF AGRICULTURE.

CUNNINGHAM (A.). **The Cultivation of Lucerne.** *Scott. Journ. Agric.*, 1928, vol. xi, pp. 42-50.

A study has been made of some of the difficulties encountered in the growing of Lucerne in the south-eastern counties of Scotland. As a rule where the pH of the soil was below 6.0 it was found to be impossible to establish a satisfactory crop even after the soil has been limed. The Grimm variety proved to be more frost resistant and a larger cropper than Provence. Inoculation produced increases in yield of from 20 to 162 per cent. and almost doubled the percentage of nitrogen in the dry matter. Of the two strains of nodule bacteria used one produced its effects during the first year while the other frequently failed to increase the yield till the second season. Details on sowing, cultivation and harvesting are included.

EDINBURGH AND EAST OF SCOTLAND COLLEGE OF AGRICULTURE.

SMITH (The late WM. G.). **Notes on the Effect of Cutting Bracken** (*Pteris aquilina*, L.). *Trans. Bot. Soc., Edin.*, 1927-28, vol. xxx, pt. 1.

Experiments indicate the advisability of mowing Bracken about July 1st, eight to ten weeks after appearance. A detailed examination of rhizomes from uncut and cut areas shows that deterioration after cutting is due to failure of food reserves in the rhizomes, and to the break-up of large continuous plants into smaller units, which are situated nearer the surface. Even after three years' mowing, a large number of buds may be present, although the leaves produced are small. The occurrence of two fronds per annum on the same branch is illustrated.

(4) GRASSLAND.

ANIMAL NUTRITION INSTITUTE, CAMBRIDGE.

WOODMAN (H. E.). **The Effect of Meteorological Conditions on the Rate of Growth of Pasture Grass.** *Rep. Agric. Meteor. Conf.*, 1927 (Min. Agric.), p. 55.

A detailed account of the factors which influence the seasonal productivity of pastures, with special reference to the observations which were made in the Cambridge pasture investigations of 1925 and 1926.

WOODMAN (H. E.). **The Close Grazing of Pastures.** *Berks. & Essex Farmers' Yr. Bks.*, 1928.

An account of the practical significance of the Cambridge pasture investigations.

WELSH PLANT BREEDING STATION, ABERYSTWYTH.

DAVIES (W.). **The Influence of Seed Rate on the Establishment of Perennial Rye-grass, Timothy and Rough-stalked Meadow Grass.** *Welsh Journ. Agric.*, Jan., 1928, vol. iv, p. 250.

Evidence is brought forward to show that the high positive correlation previously found as between size of seed in herbage plants and the percentage soil establishment is determined by the inherent characteristics of the species and is not due to the influence of seed rate.

DAVIES (W.). **The Factor of Competition Between One Species and Another in Seeds Mixtures.** *Welsh Plant Breed. Stat. Bull.*, Sept., 1928, Series H., No. 8, p. 82.

A number of critical agronomic experiments are discussed in relation to competition in seeds mixtures. It is shown that on newly sown leys a species is aggressive in proportion to its rapidity of soil establishment and in proportion to its subsequent rate of growth. Under hay conditions competition is largely a function of shading, and except on land of low fertility root competition does not appear to constitute a factor of prime importance in normal sward development.

The influence of specific grasses and clovers on each other is discussed and evidence is brought forward to show the influence of the competition factor upon the phenomenon of latency.

The experiments now collated have given more exact information on grassland technique and they have important practical implications.

DAVIES (W.) & THOMAS (M.T.). **The Behaviour of Grasses in the Seeding Year, when Sown in Pure Plots: Establishment, Rate of Growth and Palatability.** *Welsh Journ. Agric.*, Jan., 1928, vol. iv, p. 206.

The agronomic behaviour of a number of grasses and clovers was studied in the seeding year. The work was conducted on plots sown with a single species or strain. Wide differences were found in the relative soil establishment, growth and tillering, palatability and winter greenness of the several species under test. Italian rye-grass was shown to be outstanding in its rapidity of seedling development, while the studies showed that fog (*Holcus*.

lanatus) has a not inconsiderable potential value under a proper system of pasture management. General notes are made summarising the seeding year behaviour of each species tested.

JENKIN (T. J.). **Inheritance in *Lolium perenne* L. I. Seedling Characters, Lethal and Yellow-tipped Albino.** *Journ. Genet.*, May, 1928, vol. xix, No. 3, p. 391.

On selfing, a vigorous full green perennial rye-grass plant was found to be highly self-sterile, but the few seedlings obtained were of three distinct types. One type was full green, and, apart from seedlings dying back through sheer lack of vigour, all seedlings of this type survived. A second type was at first indistinguishable from the surviving green, but failed to survive beyond the early two-leaf stage. The third type was strongly chlorophyll-deficient, but in spite of this some seedlings were capable of surviving beyond the two-leaf stage. The inheritance of these two recessive types has been studied and segregation has been found to be in each case of the monohybrid type.

JENKIN (T. J.). **Inheritance in *Lolium perenne* L. II. A Second Pair of Lethal Factors.** *Journ. Genet.*, May, 1928, vol. xix, No. 3, p. 403.

Another plant, on selfing, was found to give, amongst other types of seedlings, a type indistinguishable in behaviour from the non-surviving green reported upon in the first paper of the series. When the two plants were intercrossed, no such seedlings were obtained in F_1 , but in later generations they reappeared in such proportions as to show that, despite the similarity of the seedlings obtained, they were not due to one and the same pair of lethal factors.

MILTON (W. E. J.). **An Investigation into the Soil Germination and Yield of Certain Crucifers, Clovers, Italian Rye-grass and Chicory sown at Three-weekly Intervals from May to November, 1925.** *Welsh Journ. Agric.*, Jan., 1928, vol. iv, p. 222.

The soil germination of the species was studied in connection with the temperature and the rainfall subsequent to each sowing. There was a tendency for the soil germination of all the species to increase as the weather became warmer, and to be at the maximum from the end of June to the end of August.

The yields of the species were affected to a marked extent by the time of sowing. It was shown, however, that no very appreciable connection existed between the soil germination and the yield. The Italian rye-grass contained a much higher percentage of dry matter than did the crucifers.

STAPLEDON (R. G.). **Herbage Seed Production in New Zealand. V. Species of Lesser Importance and General Conclusions as Affecting the British Farmer.** *Journ. Min. Agric.*, Oct., 1927, vol. xxxiv, No. 7, p. 618.

The methods of seed production adopted in New Zealand in the case of Chewing's fescue, brown top (*Agrostis vulgaris*) and the bird's foot trefoils are dealt with.

The relation of these methods of grassland rejuvenation and improvement are explained. In conclusion it is pointed out that seed production and the revenue derived from seed transactions has had a marked influence on the prosperity of whole districts in New Zealand, and has also reacted decisively on the character of the rotations practised.

STAPLEDON (R. G.). **Grassland Improvement by Ploughing and Re-seeding.** *Hereford Breed. Ann. Breed. Guide*, Feb., 1928, p. 23.

The question of the provision of adequate water facilities for drinking is discussed in relation to the proper and scientific fencing of fields. It is pointed out that the first necessity in grassland improvement is to fence properly and that this is impossible if water is not readily available at a sufficient number of points.

The precautions to be taken to ensure good establishment when fields are ploughed and immediately re-sown are discussed. It is pointed out that it is desirable to graze as soon as possible after sowing in order to consolidate the ground, and with a view to this end Italian rye-grass and rape should always contribute in generous amount to the mixture.

STAPLEDON (R. G.). **Cocksfoot Grass (*Dactylis glomerata* L.): Ecotypes in Relation to the Biotic Factor.** *Journ. Ecol.*, Feb., 1928, vol. xvi, No. 1, p. 71.

The chief growth forms of cocksfoot are described in terms of quantitative analyses. The genetical stability of the six chief growth form groups are discussed in relation to self- and cross-fertility and vigour. It is shown that these forms in the main tend to breed true to their salient characteristics. It is found that the several growth forms bear a close relationship to habitat, and the matter is considered relative to ecotypical selection having particular regard to influences of the grazing animal on habitat modification.

STAPLEDON (R. G.). **The Growing of Pedigree Herbage Plants for Seed Production.** *Essex F.U. Yr. Bk.*, March, 1928, p. 121.

The value of pedigree strains is discussed and results from recent trials quoted to substantiate the merits of wild white clover and of late-flowering red clover. Results are also quoted to show the marked persistency and leafiness of strains of cocksfoot, timothy and perennial rye-grass selected at the Welsh Plant Breeding Station.

Suggestions are made for the organization of seed production on pedigree lines—and as to the precautions that are necessary with a view to this end.

STAPLEDON (R. G.). **Species in Relation to the Management and Improvement of Grassland.** *Scott. Journ. Agric.*, Apr., 1928, vol. xi, No. 2, p. 125.

The characteristics which are desirable in herbage plants are:—high nutritive value and productivity; prolonged seasonal productivity; adequate mineral content; high palatability and eatability and persistency. It is pointed out that under modern conditions persistency is perhaps the most important of all these characteristics, especially under conditions of low fertility. The value of Yorkshire fog, the bent grasses, and of wild red clover and the bird's foot trefoils for such habitats is insisted upon, and suggestions are made for the proper management of swards consisting largely of these species.

STAPLEDON (R. G.), and DAVIES (WILLIAM). **Seeds Mixture Experiments with Special Reference to the Influence of Environmental Factors.** *Welsh Plant Breed. Stat. Bull.*, Sept., 1928, Series H., No. 8, p. 7.

Seeds mixtures sown on fields not well cleaned form swards which deteriorate much faster when hay is taken than when the fields are used only as pastures. Heavy sowings of crested dogtail, rough stalked meadow

grass and wild white clover—with abundance of Italian rye-grass as a temporary fatter, under a proper system of intermittent grazing lead to the formation of good grazing swards, even under highly unfavourable conditions.

The establishment of the smaller grasses and wild white clover is seriously hampered by severe competition with either rye-grasses, or weeds, during the autumn of the seeding year. Indigenous strains of cocksfoot, perennial rye-grass and timothy have contributed in a more lasting manner to the swards than have the non-indigenous strains.

STAPLEDON (R. G.) and DAVIES (WILLIAM). Sensible Seeds Mixtures.
Welsh Plant Breed. Stat. Bull., Sept., 1928, Series H, No. 8, p. 150.

The evidence from a very large number of trials is discussed. This evidence shows that seeds mixtures should be drawn up with due regard to the purpose they are intended to fulfil. Thus considered seeds mixtures fall into four classes: (1) Those intended to provide grazing swards only; (2) Those intended to provide heavy hay crops year after year, the grazing being a secondary consideration; (3) Those intended to provide hay in the first and (or) second years and then to develop into grazing swards, and (4) Those intended to provide hay and abundant grazing each year. The type of mixture suitable for each of these purposes is discussed in relation to the propensity of the various species for different habitat conditions; the conditions most favourable to germination and establishment—the balance of the sward and the response of the several species to different shades of management.

FAGAN (T. W.). Factors that Influence the Chemical Composition of Hay. *Welsh Journ. of Agric.*, 1928, p. 92.

Hay should be cut a few days after it has reached its maximum stage of flowering and before seed formation. The presence of clover in hay increases its protein and mineral content, especially lime. The more leafy the hay the better its quality, and every care should be taken that the leaves and flower heads (particularly in the case of clovers) are not broken off and lost. Nitrogenous manures increase the protein content of the hay and tend to decrease the fibre. Phosphatic manures, apart from any increase in clover that may follow their application, affect the mineral content of hay. Potash manures in the area do not appear to have any appreciable influence on its composition. Hay harvested under unfavourable climatic conditions is characterised by a high fibre content and a low percentage of protein.

SCOTTISH SOCIETY FOR RESEARCH IN PLANT BREEDING.

GREGOR (J. W.). Pollination and Seed Production in the Rye-grasses (*Lolium perenne* and *L. italicum*). *Trans. Roy. Soc. Edin.*, 1928, vol. Iv, pt. iii, No. 30.

Plants of *L. perenne* and *L. italicum* exhibited a low degree of self-fertility. It is apparent that cross-fertilisation in the majority of cases is more or less compulsory. It has, however, been shown that there are limits to cross-fertilisation. That pollen-tube growth is more rapid in some genetic combinations than in others is indicated.

MANCHESTER UNIVERSITY.

ORR (J.). The Mat in Grassland. *Journ. Min. Agric.*, Apr., 1928, vol. xxxv, No. 1.

To recover the pasture and meadow land in East Lancashire from an unprofitable state a number of experiments were made. The problem was

to break up the mat which interfered with the growth of valuable grasses. Farmers would not undertake cultivation with the plough, and alternatives were sought. The most successful has been to use lime and phosphates and sow wild white clover, accompanied by drastic harrowing. This has produced satisfactory results in a very short time. The cost of the complete treatment was about £3 15s. 9d. per acre. The aggressive activity of the wild white clover is bringing about the decomposition of the mat.

UNIVERSITY COLLEGE OF NORTH WALES.

ROBERTS (R. ALUN). **The Composition of Old Pastures of High Reputation in North Wales.** *Welsh Journ. Agric.* 1928, vol. iv, pp. 170-183.

Eleven pastures were examined. They were found to be on deep, well-drained soils with favourable aspects and high water tables. They were mostly not static types ecologically, but transitional, with a slight heath element in them; by judicious management they are maintained so indefinitely. They were all early in spring, and grew steadily until well on into summer. They are never closely grazed in spring, but never allowed to grow rank. The significance of this is discussed for their particular purpose. They are all high in white clover and rye-grass content, with varying amounts of other excellent species; but bent grass and Yorkshire fog are also high.

UNIVERSITY COLLEGE OF SOUTH WALES AND MONMOUTHSHIRE.

REES (J.). **Sainfoin or French Grass in South Wales.** *Welsh Journ. Agric.* vol. iv, pp. 242-258.

An account of the introduction and history of sainfoin and other forage crops to Glamorgan, and its distribution at the beginning of the 19th and 20th centuries is given. A general survey is made of the present condition and practice on the farms, together with the results of a few preliminary tests, with locally collected seed and comparisons between common and giant with regard to growth and flowering habit and differences found amongst common lots from different sources. A note on diseases and pests is added.

EDINBURGH AND EAST OF SCOTLAND COLLEGE OF AGRICULTURE.

SMITH (The late WM. G.). **The Tweed Basin: Hill Pastures and Sheep Rearing.** Great Britain: Essays in Regional Geography. *Cambr. Univ. Press*, 1928.

A short account of the distribution of sheep farms, and their utilisation. The Upper Tweed is distinguished by large farms with little or no arable land and few cattle. The widening of the river haughs brings increase of arable land and woodlands, with more cattle and the rearing of cross-bred lambs. The pure-bred ewe stocks of the upper farms supply the mothers for the low-ground lambs. The winter stocking of the hill farm is determined by the proportion of various types of herbage indicated, parts of which are capable of improvement.

(5) ENTOMOLOGY

and Plant Helminthology.

HORTICULTURAL RESEARCH STATION AND SCHOOL OF AGRICULTURE, CAMBRIDGE.

WOODMAN (R. M.). **A Survey of Some Emulsion Problems Confronting the Sprayer.** *Journ. Pom. Hort. Sci.*, 1928, vol. vi, pp. 313-318.

It is shown that two types of emulsion are possible, oil-in-water and water-in-oil, when the materials for making an emulsion are shaken together. Of these two types, the oil-in-water is the one necessary to the sprayer, as it represents true dilution of the oil.

It is shown that the type formed depends often on the relative proportions of oil and emulsifying medium shaken together, on the mechanical treatment during preparation, and sometimes on the after-treatment of the emulsion when once made.

The hardness of water and its influence on emulsion formation is explained, methods for overcoming hardness of water being given.

PETHERBRIDGE (F. R.), and THORPE (W. H.). **Notes on the Capsid Bugs Found on Species of *Ribes*.** *Ent. Month. Mag.*, May, 1928, vol. lxiv.

These notes were collected in 1926 and 1927. The only species causing serious damage were *Lygus pabulinus* and *Plesiocoris rugicollis*. Descriptions of larval stages of some of the bugs are given.

PETHERBRIDGE (F. R.). **How the Ribbon-like Scars on Apples are Caused by the Apple Sawfly (*Hoplocampa testudinea* Klug.).** *Journ. Pom. Hort. Sci.*, July, 1928, vol. vii.

This article gives an account of observations made on the feeding of the apple sawfly larva. In addition to eating out large cavities in the centre of the fruit the larvae also bore tunnels under the skin, and when the apples remain on the trees these tunnels develop into characteristic scars.

PETHERBRIDGE (F. R.), and THORPE (W. H.). **The Common Green Capsid Bug, *Lygus pabulinus*.** *Ann. App. Biol.*, Aug., 1928, vol. xv, No. 3.

The capsid bug *Lygus pabulinus* has become a serious pest of currants, gooseberries, strawberries, potatoes and dahlias, and is also present on apples, pears, plums, cherries and peaches, and a large number of cultivated plants and weeds.

A detailed account is given of the characteristics and measurements of the various stages which will serve the purpose of identification, and also of the genitalia.

Diagnostic characters are given for the purposes of distinguishing it from the *P. rugicollis*, which causes similar damage on currants and apples.

There are two generations per annum. Eggs are laid in the autumn in woody plants such as currants, gooseberries, apples and roses, and then migration to herbaceous hosts usually takes place, where the summer eggs are laid, the second generation returning to the woody host to lay their eggs.

In the first generation a secondary migration from strawberries to other herbaceous hosts takes place. Details are given of the damage done to the more important host plants and of the habits of the bug in its various stages. Control measures are given.

HORTICULTURAL RESEARCH STATION, EAST MALLING.

MASSEE (A. M.). **Descriptions of Three New Species of Gall-Mites (*Eriophyidae*) from Sudan.** *Ann. & Mag. of Nat. Hist.*, 1927, ser. 9, vol. xx, p. 372.

Eriophyes balanites, sp. n., produces numerous pear-shaped cephaloneon galls on upper surfaces of leaves of *Balanites aegyptiaca*, Del., and also causes leaf curling.

Eriophyes cernuus, sp. n., produces oak-apple-like galls on the new growths of "Sidr" (*Zizyphus*), and also malformation of the buds. *Eriophyes lurius*, sp. n., is the cause of the large, irregular, knot-like galls on shoots of "Sidr" (*Zizyphus*), and also malformation of buds.

MASSEE (A. M.). **A Contribution to the Knowledge of the Species of Gall-Mites (*Eriophyidae*) of Sussex.** *Ann. & Mag. of Nat. Hist.*, 1927, ser. 9, vol. xx, p. 375.

A list of 21 species is tabulated, including host plants, description of galls, and localities. *Eriophyes iteinus* (*typicus*), Nal., found on willows, is recorded for the first time in Britain.

MASSEE (A. M.). **A Note on The Black Currant Gall-Mite on Red Currants.** *Journ. Min. Agric.* Nov., 1927, vol. xxxiv, No. 8, p. 693.

The occurrence of the Black Currant Gall-Mite (*Eriophyes ribis* (westw.) Nal.), on red currant bushes is discussed. A description of the disease is given; also reference is made to susceptible varieties.

MASSEE (A. M.). **On the Species of Gall-Mites (*Eriophyidae*) Found on the Genus *Ribes*.** *Bull. Ent. Res.*, 1927, vol. xviii, p. 179.

Systematic descriptions of three species of Gall-Mites are given, namely, *Eriophyes Ribis* (Westw.), Nal., the so-called big-bud of our gardens; *Phyllocoptes masseei* Nal., a free living species found on the under surface of black currant leaves, and *Oxypleurites neglectus*, sp. n., found amongst the hairs on the lower surface of the leaves, usually in association with *P. masseei* Nal.

A key to the genera of mites described is included.

MASSEE (A. M.). **The Life-History of the Black Currant Gall Mite, *Eriophyes ribis* (Westw.) Nal.** *Bull. Ent. Res.*, 1928, vol. 18, p. 297.

An extensive summary is given of the observations of previous workers on the bionomics of this mite. The mites enter the newly formed buds towards the end of May or June. In an average season swollen buds are seen by the third week in August. Spring migration from the big-buds reaches its height at end of April or in May.

Eggs are present all the year round. They may be deposited on the shoots, blossoms or leaves.

Experiments proved that they do not pass any period of their life-cycle in the soil.

During the migration period the mites are carried about by various insects, including Ladybirds.

The chief natural enemy is the Chalcid parasite, *Tetrastichus eriophyes* Taylor.

Host plants: black currants, red and white currant, gooseberry and the American flowering currant.

MASSEE (A. M.). **Winter Washes: Modern Developments in Their Use.** *E.M.R.S. Ann. Rep.*, 1927, May, 1928, (I. Gen.), pp. 70-78.

The uses of the older winter washes, caustic soda, hot lime, and lime sulphur, are discussed, and the development of the use of the two latter as delayed dormant sprays is emphasised.

The use and effect of the true egg-killing washes—the tar-distillates—in the dormant season is described, and a number of recommendations made. Attention is drawn also to the existence of other substances now known to possess egg-killing properties, i.e., dinitro-o-cresol and its salts.

MASSEE (A. M.). **Note on Apple Capsid.** *Gard. Chron.*, 1928, vol. 83, p. 399.

The date of hatching of the apple capsid bug (*Plestocoris rugicollis* Fall.), is recorded. In the Swanley District, capsids were seen to emerge from their eggs up to the 4th May, but it is considered that hatching had not finished at that date.

MASSEE (A. M.), and STEER (W.). **Capsid Bugs.** *Gard. Chron.*, 1928, vol. 84, p. 154.

Observations on the oviposition of the Potato Capsid Bug, *Calocoris bipunctatus* Fabr. (*Norvegicus* Reut., and Oshanin Catalogue), are described. The capsid was observed to lay eggs, often at the rate of sixty to seventy an hour, in old chestnut wood used as fencing. The method of oviposition and the egg are described. Diagrams are given of the ovipositor ($\times 62$) and the egg ($\times 71.4$) of *C. bipunctatus*. (The magnifications as they appear in the legends to the diagrams are incorrect.)

MASSEE (A. M.) and STEER (W.). **The Oviposition of *Calocoris bipunctatus* Fabr.** *Ent. Month. Mag.*, 1928, vol. 84, p. 207.

This is a record and description of the oviposition of *Calocoris bipunctatus* Fabr. (Capsidae), in old chestnut fencing at the East Malling Horticultural Research Station, Kent (Eng.).

LONG ASHTON FRUIT RESEARCH STATION AND UNIVERSITY OF BRISTOL.

BALL (E.), MANN (C. E. T.) and STANILAND (L. N.). ***Strawberry Investigations at Long Ashton, II.** *Journ. Min. Agric.*, Oct., 1927, vol. xxxiv, No. 7.

The first section of this paper deals with the work on "strains." The importance of "strains" is emphasised.

The remaining sections deal with strawberry "diseases." The symptoms of 'red plant' and 'cauliflower' disease are set down and the importance of the eelworm *Aphelenchus fragariae* in relation to the "diseases" is discussed, it being shown that the evidence is so far purely circumstantial. The control of these "diseases" by means of rogueing is described.

The production of "small leaf" by the strawberry aphid (*Capitophorus fragariae*) is described together with the life history; information is given on "strain" and varietal susceptibility.

The control of aphid by dipping runners, and by dusting or spraying, is outlined. A list of abnormal types of plant is appended.

* Part I. has already been abstracted.

UNIVERSITY OF BRISTOL.

LEES (A. H.) and STANILAND (L. N.). **Further Experiments with Tar-Distillate Washes.** *Journ. Min. Agric.*, Jan., 1928, vol. xxxiv, No. 10.

The results of tests of two commercial brands of tar-distillate wash, used at strengths of 4, 8 and 10 per cent., on apples, during the dormant period, are given. The figures given show that the additional killing power against caterpillars and, more especially, Capsid Bug, is worth employing, having regard to the small extra expense.

Experiments are described which show that rain following the application of tar-distillate washes has an adverse effect on the apparent egg-killing power of the wash.

Experiments on the time of application of the washes in relation to bud damage are described in relation to plums and black currants.

TUTIN (F.). **Investigations on Tar-Distillate and other Spray Liquids. Part I.** *Ann. Rep. Long Ashton Res. Stat.*, 1927, p. 81.

The portion of tar-distillates which is of most value for destroying insect eggs is the liquid, neutral material boiling from 280–360° C. This high-boiling neutral product is also less injurious to plants than are spray liquids which contain "tar acids."

The presence of "tar acids" is also a disadvantage from the egg-killing point of view.

The high-boiling neutral material cannot be emulsified satisfactorily by means of any soap, but perfect emulsions of it may be prepared by means of Agral W.B.

It has also been found that Agral W.B. is not only of use for the preparation of tar distillate emulsions, but that it may, with advantage, be used for the preparation of a large number of other emulsions suitable for use as spray liquids, for example, rape oil, paraffin, nitrobenzene, etc. Rape oil emulsions may also be prepared with the aid of Agral I, a new preparation possessing great wetting powers.

Nicotine sprays prepared with the aid of Agral I are more efficient against woolly aphids than are the usual nicotine-soap spray liquids.

INSTITUTE OF AGRICULTURAL PARASITOLOGY, LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE.

GOODEY (T.). **On the Nematode Genus *Aphelenchus*.** *Journ. Helm.*, vol. v, No. 4.

The paper contains a description of a new species *Aphelenchus winchesi*, obtained from pig-manure. The type species of the genus *A. avenae* Bastian, 1865 is re-described in detail, and its affinities to certain other nearly related genera and species are discussed.

GOODEY (T.). **The Species of the Genus *Aphelenchus*.** *Journ. Helm.*, vol. vi, No. 3.

This paper deals with the species of *Aphelenchus* so far described. The plant-parasitic forms attacking strawberry, chrysanthemum, black currant and ferns are examined in detail, and compared from the morphological standpoint, and brief descriptions are given of other plant-parasitic species. Short accounts are given of the free-living species, and in this category two new species, *A. pseudolesistus* and *A. demani*, are described and figured. A section is devoted to "species inquirendae" and another to "species wrongly attributed to the genus." An alphabetical list of all the species is added.

TRIFFITT (M. J.). **On the Morphology of *Heterodera schachtii* with Special Reference to the Potato-strain.** *Journ. Helm.*, vol. vi, No. 1.

A morphological survey of three physiological strains of *H. schachtii* specialised on Beet, Oats, and Potato is given. Dimensional variations much greater than those indicated by previous workers are found to exist within each strain, while the main morphological characters, with the exception of the shape of the brown cyst, remain the same. This, together with Zimmermann's observations on a specialised Potato-strain attacking Beet, leads to the conclusion that only a single species of *Heterodera* is represented. *H. rostochiensis* Wollenweber, 1923, becomes, therefore, a synonym for *H. schachtii*.

MINISTRY OF AGRICULTURE AND FISHERIES,
PATHOLOGICAL LABORATORY.

FRYER (J. C. F.), TATTERSFIELD (F.), and GIMINGHAM (C. T.). **English-Grown Pyrethrum as an Insecticide.** *Ann. App. Biol.*, Aug., 1928, vol. xv, No. 3, pp. 423-445.

The toxicity to *Aphis rumicis* L. and to certain caterpillars of spray fluids prepared from samples of pyrethrum (*Chrysanthemum cinerariaefolium*) grown in England from Swiss and Japanese seed have been quantitatively determined.

Pyrethrum flowers, grown in six different localities, showed only slight differences, and, for practical purposes, all the samples had approximately the same toxicity. They did not differ in this respect significantly from a sample grown on the Continent.

The toxicities of extracts of equal weights of pyrethrum flowers tested at different stages of development differed very little.

Artificial drying of the flowers had no significant effect on the toxic properties.

The flowers were about ten times as toxic as the stalks, weight for weight.

Prolonged exposure of pyrethrum to wet conditions led to some loss of toxicity, but contrary to the usual opinion, if stored in a reasonable manner, it remained for long periods without deterioration.

Caterpillars of different species showed marked differences in susceptibility to the action of pyrethrum.

The biological method employed has proved suitable for evaluating samples of pyrethrum.

ROTHAMSTED EXPERIMENTAL STATION.

BARNES (H. F.). **Wheat Blossom Midges (*Cecidomyidae*, *Diptera*). Differences between *Contarinia tritici* (Kirby) and *Sitodiplosis mosellana* (Gehin).** *Bull. Ent. Res.*, 1928, vol. xviii, pp. 285-288.

In the past wherever Cecidomyid larvae have been found in the ears of wheat the presumption has been that the species concerned was *C. tritici*: this error has been made both in England and N. America. It is shown that in the vast number of cases of infection the species concerned is *S. mosellana*, which attacks the kernel and not the anthers as does *tritici*. Full descriptions and figures are given for separating the two species in question.

BARNES (H. F.). **Gall Midges (*Cecidomyidae*) infesting Wild Figs in the Philippine Islands.** *Bull. 19, Ent. Soc. Hawaiian Sugar Plant. Exp. Stat.*, pp. 21-23.

A description of certain midges bred from wild figs. A new species *Meterdiplosis fici* and a new genus *Asphrotrophia* species *fici* nov. are described.

BARNES (H. F.). *Neptumimya Felt, a Gall Midge Genus new to Great Britain*. *Entomologist*, 1928, vol. xli, pp. 173-175.

The contents are covered by the title.

BARNES (H. F.). *Insects of Samoa. Cecidomyiinae*. "Insects of Samoa," Pt. vi, 1928, *Brit. Mus.*, pp. 103-108.

Descriptions of new genera and species of Gall Midges discovered by Messrs. Buxton and Hopkins in the Samoan Islands.

BARNES (H. F.). *The Chrysanthemum Midges*. *Entomologist*, 1928, vol. lxi, 3 pp.

A description of the life-history and damage caused by this insect, which has recently become accidentally introduced into Britain in Hertfordshire and Essex. Measures of control are also discussed.

DAVIES (W. M.). *The Effect of Variation in Relative Humidity on Certain Species of Collembola*. *Brit. Journ. Exp. Biol.*, 1928, vol. vi, pp. 79-86.

It was found that, with the exception of the genus *Entomobrya*, Collembola devoid of a tracheal system, are very susceptible to atmospheric dryness. Species which possess a tracheal system are capable of withstanding complete dryness for a period of 10 hours, or double the maximum time found for non-tracheate forms. The influence of variation to relative humidity in the death-rate of various species has been studied, and at a uniform temperature of 25° C. a saturated atmosphere was found necessary for survival. The work has a definite practical bearing, since it explains why methods of controlling *Bourletiella hortensis* require to be carried out in early morning or after heavy rain during the day: at other times this insect retreats below the soil.

DAVIES (W. M.). *The Bionomics of Apion ulicia (Gorse Weevil) with Special Reference to its Role in the Control of Ulex europaeus in New Zealand*. *Ann. App. Biol.*, 1928, vol. xv, pp. 263-286, 3 pls.

The external morphology of this species in its different stages is described and the details of its biology and feeding habits are given. The effects of the feeding of the adults and larvae on the host plant are described together with tabular results of a study of pod infection from samples taken from 62 districts in Great Britain. As high as 92 per cent. infection was observed in some cases. Prolonged tests were carried out with respect to the possibility of the *Apion* attacking cultivated leguminous plants, but gave negative results. The species is considered valuable for the purpose of attempting the control of the spread of gorse in New Zealand, and shipments have been made to that country for this purpose.

DAVIES (W. M.). *On the Economic Status and Bionomics of Sminthurus viridis* Lubb. (Collembola). *Bull. Ent. Res.*, Feb., 1928, vol. xviii, pt. 3, pp. 291-296.

This paper places on record experiments which leave no doubt as to the economic significance of *Sminthurus viridis*, a species of Collembola, which group has previously been regarded as of little economic importance. This species is widely distributed, and a long list of host plants is given. Field observation revealed the damage caused to grass land, especially clover, and photographs of experimental pots of clover prove the damage to be very appreciable.

Control methods include rolling, harrowing and close grazing, and, in severe attacks dragging with tarred sacks and the application of nicotine sulphate.

A preliminary account of the bionomics of *Sminthurus viridis* is given. Ovaposition takes place throughout the year; eggs laid in batches are hidden by excretes. Under laboratory conditions hatching took place in 35 to 40 days. Feeding occurs throughout development, and the insect is mature in about 8 to 10 weeks.

DAVIES (W. M.) **Biological Control of Noxious Weeds.** *North West. Nat.*, Mar., 1928, vol. III, No. 1, pp. 22-25.

Several plants, including Blackberry, Gorse, Ragwort and St. John's Wort, have been introduced, accidentally or otherwise, into New Zealand, and under the favourable conditions of the new environment have spread at an extraordinary rate. A scheme has been launched by the Empire Marketing Board, the New Zealand Government and the Cawthron Institute, New Zealand, to study the possibilities of applying, under strict scientific supervision, biological methods of control to this problem.

The initial research work on this subject in the Hawaiian Islands and Australia is recorded.

An account is given of the progress already made in the study of insect pests of gorse, ragwort and blackberry. The critical tests and experiments carried out with a view to ascertaining the potential value of the insects studied for the work are briefly described.

GIMINGHAM (C. T.) and TATTERSFIELD (F.) (Editors). **A Report on Field Trials with 3 : 5-Dinitro-o-cresol and its Sodium Salt for Winter Spraying.** *Journ. Pom. & Hort. Sci.*, 1928, vol. vii, p. 146.

At the request of Mr. J. C. F. Fryer, Director of the Plant Pathological Laboratory of the Ministry of Agriculture and Fisheries, the Entomological Advisers of several provinces kindly undertook to carry out field trials with 3 : 5-Dinitro-o-cresol and its Sodium Salt during the winter of 1926-27, and the results of these series of experiments are given in the form of separate reports from each of the experimenters.

HANDSCHIN (E.). **Die Oekologie der Collembolenfauna westfälischer Hochmoore.** *Zeits. wiss. Insektenbiologie*, 1927, vol. xxii, pp. 295-310.

An ecological study of the distribution of Collembola in the region concerned. Written while author was Rockefeller student at Rothamsted.

TATTERSFIELD (F.). **The Decomposition of Naphthalene in the Soil and the Effect upon its Insecticidal Action.** *Ann. App. Biol.*, 1928, vol. xv, p. 57.

Naphthalene incorporated with soil shows a fairly high toxic action to wireworms. Toxicity, however, is lost with time. This loss has been determined and shown to depend upon some factor inherent in the soil. Soil sterilisation eliminates the factor. Bacterial numbers of the soil rise rapidly as the rate of disappearance increases. Methods of estimating naphthalene are described.

HARPER ADAMS AGRICULTURAL COLLEGE.

JARY (S. G.). **Tar Oil Wash Trials in the West Midlands.** *Journ. Min. Agric.*, March, 1928, vol. xxxiv, No. 12.

A continuation of the previous trials in the West Midlands.

Three proprietary washes and two di-nitro-cresol washes prepared at Rothamsted were used. Plums, damsons and apples were sprayed.

Aphis pomi, *Anuraphis roseus*, *A. helichrysi* and *Psylla mali* were well controlled. Winter Moth Caterpillars were reduced, but Apple Capsid Bug (*Plesiocoris rugicollis*) little affected. Attention is drawn to the uneven distribution of *P. rugicollis* on adjacent trees.

The di-nitro-cresol preparations were slightly less effective than the proprietary washes.

MIDLAND AGRICULTURAL COLLEGE.

ROEBUCK (A.). **The Genus *Phaedon*.** *Linc. Nat. Union Trans.*, 1927:

This small genus contains one serious pest and two potential pests of crops. *Phaedon cochleariae* as a pest of Mustard and Watercress is described with control measures. The mode of life of this land species as a semi-aquatic insect is noted. *Ph. tumidulus* as a potential pest of Umbellifers, especially Celery, is described. *Ph. armoraciae* is given as a potential pest of Mustard and Watercress.

ROEBUCK (A.). **Eelworm Attack on Potatoes.** *Fruit Grower*, Jan. 12th, 1928, vol. lxxv, No. 1674.

Describes the danger of further extension and the mode and rate of spread. An account of a promising line of control is given.

ROEBUCK (A.). **A Census of Rooks.** *Times*, Sept. 24th, 1928.

A summary in the nature of a progress report on the main facts of a survey of the rookeries and census of the rooks of the counties of Leicestershire, Nottinghamshire and Rutland.

LEEDS UNIVERSITY.

TAYLOR (T. H.) & THOMPSON (H.W.). **Garden Chafer Attack.** *Ann. App. Biol.*, May, 1928.

The larvae were found destroying a pasture near Bolton Abbey during winter, 1919-20. Steps were taken to test the method of controlling the attack by collecting the adult. In June, 1920, the latter were found swarming on bracken and were collected in large numbers by means of a specially devised box-trap. One year's trapping was effective and the pasture has since been normal.

TAYLOR (T. H.). **Watercress Leaf-miner.** *Ent.' Month. Mag.*, June, 1928.

The watercress sent to Leeds market is during January and February often mined by the larva of *Hydrellia nasturii*, identified and named as a new species by J. E. Collin. Nothing is known of its life history and so far the fly has not been found in Yorkshire.

MANCHESTER UNIVERSITY.

MILES (H. W.) with TURNER (W.H.). **On the Control of the Root Knot Eelworm, *Heterodera radicum* Mull.** *Journ. Helm.*, 1928, vol. vi, No. 2, pp. 59-76 (1 pl., 17 refs.).

The Root Knot Disease of tomatoes and cucumbers caused by the eelworm, *Heterodera radicum*, is of widespread occurrence and under certain conditions may cause serious losses.

Experiments using calcium cyanide as a vermicide have been carried out at a number of centres in 1926 and 1927 and are herein described. Where

tomatoes were grown in soil treated with 750 lb. to 2,000 lb. of calcium cyanide per acre the infestations were substantially reduced and in some instances over 90 per cent. healthy plants were produced.

The application of calcium cyanide in solution proved more efficient than the dry form in the autumn, but in spring when used under suitable soil temperature conditions, the use of the dry form resulted in the production of 96-99 per cent. of healthy plants.

MILES (H. W.). **The Bay Psyllid**, *Trioza alacris* Flor. *North-West. Nat.*, 1928, vol. iii, pp. 8-14 (3 pl., 17 ref.).

The Bay Psyllid is one of the most serious pests of bays on the Continent; it has been found on imported bays and occurred as a serious pest in a commercial nursery where bays are raised from cuttings. In this paper a general account of the insect is given and descriptions of the damage it does to the foliage. The life history is described and control measures as adopted in Belgium and America discussed. Fumigation of the stored bays during the winter with hydrocyanic acid gas or with nicotine and careful spraying of cuttings and young bushes with nicotine wash are advised.

MILES (H. W.). **Insect Pests of Tomatoes and Chrysanthemums**. *Journ. Bath & West Agric. Soc.*, 1928, 6th ser., vol. ii, pp. 61-89 (5 pl., 19 refs.).

Tomatoes and Chrysanthemums are important crops in districts where commercial glasshouse culture is followed. The two crops usually follow each other almost to the entire exclusion of other crops. Because of this the insect and allied pests of the two crops have been studied together, and a preliminary account is given in this paper. The insect pests are dealt with according to their attack on roots, stems, leaves and fruit. Wireworms, chafer larvae, leather-jackets, millipedes, centipedes, eelworms, thrips, leaf hoppers, mealy bugs, white fly, tomato moth, red spider, woodlice and slugs are discussed as tomato pests and control measures advocated.

The chrysanthemum pests described and discussed include several of the foregoing, together with earwigs, capsid bugs, frog hoppers, aphides, angle shades moth, chrysanthemum midge, leaf miner, and leaf eelworm.

UNIVERSITY OF OXFORD.

CUNLIFFE (N.). **Report on a Study of the Degree of Resistance exhibited by Oat Varieties to Attack by the Frit Fly and on the Production of Resistant Utility Varieties**. *Advis. Ctee. on Agric. Sci., Development Commission, London*, 1927.

Investigations made at Svalöv indicated that pronounced variation in degree of resistance occurred (spring attack, stem loss, *Victory* 31.5 per cent. against *Summer* 3.8 per cent.) and that power of resistance appeared to be inheritable.

CUNLIFFE (N.). **Studies on *Oscinella frit* Linn. Observations on Infestation and Yield, Susceptibility to Infestation, Recovery Power, the Influence of Variety on the Rate of Growth of the Primary Shoot of the Oat and the Reaction to Manurial Treatment**. *Ann. App. Biol.*, 1928, vol. xv.

The notes collected in the present publication are each concerned with some aspect of the problem of production of varieties of oat plants resistant to the attack of the frit fly.

The quality of a variety may compensate for comparatively heavy infestation.

Data are recorded confirming previous experimentation relating to the susceptibility of the oat shoot to infestation, emphasising its limitation to the early leaf stages.

Experimentation concerned with recovery power after injury showed that different varieties of oats react very differently and indicated the importance of the primary shoot in relation to yield. A few field data are recorded to support this inference.

With common English varieties of oats the influence of variety on the rate of growth of the primary shoot was practically negligible, and therefore observed differences between varieties in extent of infestation of primary shoots cannot be ascribed to variations in rates of growth of primary shoots. The time of tillering did not depart markedly from the mean, but it was not correlated with time of shoot production, so that correlation between extent of infestation of shoot and of grain cannot be expected.

Excess of nitrogenous manure failed to influence the extent of shoot infestation but effected a reduction in the extent of grain infestation during a season when the extent of the attack of the fly was below normal.

SEALE-HAYNE AGRICULTURAL COLLEGE.

HODSON (W. E. H.) & BEAUMONT (A.). **Fourth Annual Report of the Department of Plant Pathology, Seale-Hayne Agricultural College, Newton Abbot, Devon.** *Coll. Pamph.*, 1928, No. 25, 29 pp. (Entomological Portion).

The report refers to pests of field and vegetable crops occurring in Devon and Cornwall, also to pests of fruit and of tomatoes under glass.

Pyrethrum planted in poor soil in a warm situation in 1925 bore a heavy crop of flowers in 1927.

Comparative tests of two di-nitro-cresol washes and a proprietary tar distillate wash were carried out in an apple orchard of young bush trees. It was estimated that the tar distillate gave 80 per cent. control of aphids, 50 per cent. of tortricids and 80 per cent. of caterpillars of the winter moth group, while the corresponding figures for the two di-nitro-cresol washes were 90, 60-70 and 60.

Details are given of the results of liberations of *Aphelinus mali*, Hald., for the control of *Eriosoma lanigerum*, Hausm., on apple.

HODSON (W. E. H.). **Some Insect Pests on the Farm.** *Estate Mag.*, Feb., 1928, pp. 124-129.

Farmers can rarely accurately identify the exact species of insect damaging their crops. Such information, essential to intelligent control, is supplied by Advisory Centres.

Pest control on the farm falls into two divisions: cultural, comprising earliness in breaking grassland, eradication of charlock, etc.; and artificial, e.g., poison-baiting.

Leather-jackets (*Tipula spp.*) and wireworms (*Agriotes spp.*) are worst among farm pests. The first can be destroyed by a bait of Paris-green and bran, at a cost of 6s. 6d. per acre, and the latter are best checked by thorough and clean cultivation.

SOUTH-EASTERN AGRICULTURAL COLLEGE, WYE.

AUSTIN (M.) & THEOBALD (F. V.). **Pyrethrum Experiments.** *Journ. S.E.A. Coll.*, July, 1928, No. 25, pp. 59-67.

A detailed account of a series of experiments with Pyrethrum Wash made from home-grown pyrethrum. Contains a description of the parts of the

plants employed, method of making the spray solution and its effect upon Aphides, Sawfly larvae, Little Ermine Moth larvae, Magpie Moth larvae, Winter Moth larvae, and Large Cabbage White larvae, also Red Spider.

The effect on Aphides was seen to be very good, the killing power similar to nicotine, also on Little Ermine Moth. No Magpie, Winter Moth or Cabbage White Butterfly larvae were affected or any Gooseberry Sawfly larvae. Red Spider were very susceptible and with an alcoholic solution 155 out of 162 were killed.

NEWTON (H.C.F.). **Experiments on the Control of Flea Beetles of the Genus *Phyllotreta* injurious to Cultivated Crucifer Crops.** *Journ. S.E.A. Coll.*, July, 1928, No. 25, pp. 116-140.

Contains a review of previous work, the habits and life-history of the species dealt with, spraying and dusting experiments with deterrents and stomach poisons and the action of contact insecticides, measures applicable at sowing-time, such as seed steeping, sowing deterrent dusts with the seed and seed steeping in water with soluble substances, Flea Beetle traps or carts, cultural measures at seeding time. The presence of an early underground attack, which had not previously been recognised is pointed out. Routine spraying at the time of germination is recommended. Deterrents were found to be much more effective than contact or stomach poisons; nicotine sulphate gave the best results. Steeping seed with paraffin and turpentine gave negative results. Flea Beetle carts gave useful results if conscientiously worked, where the surface is flat and free from clods.

NEWTON (H. C. F.). **The Biology of Flea Beetles (*Phyllotreta*) Attacking Cultivated Cruciferae.** *Journ. S.E.A. Coll.*, July, 1928, No. 25, pp. 90-115.

The economic species are discussed, nature and extent of their injury, host plant preferences, etc. The Bionomics of eight species are dealt with and technical descriptions given of the larvae, illustrated with two plates.

THEOBALD (F. V.). **Capsid Bugs on Fruit Trees and Bushes.** *Bull. 6, S.E.A. Coll., Res. & Adv. Dept.*, Oct., 1927, pp. 8, pp. 4.

A general account of the Capsid Bugs found on apples and currants, especially dealing with the Common Green Capsid (*Plesiocoris rugicollis*) on the apple. An account of the life-history and feeding habits is given, the varieties of apples attacked and the counties where the pest has occurred. Spraying with nicotine soap wash is recommended and spraying with plain water under pressure in conjunction with grease banding to catch those knocked off is also recommended. In the case of currants and bush apples, especially the former, spraying the soil beneath after the trees have been sprayed is recommended.

THEOBALD (F. V.). **The Rosy Rustic Moth (*Hydroecia micacea*).** *Journ. S.E.A. Coll.*, July, 1928, No. 25, pp. 71-74, pp. 2 & 3.

An account of the Rosy Rustic Moth (*Hydroecia micacea* Fab.) as a hop pest. Damage by the caterpillars to hop bine is described and illustrated and a description of the various stages of the larva is given. The damage was reported from Worcestershire and Kent.

THEOBALD (F. V.). **The Nut Bud Tortrix (*Epiblema penhleriana* Schiff.).** *Journ. S.E.A. Coll.*, July, 1928, No. 25, pp. 68-70.

An account of this Tortrix on cob-nuts in Surrey. The larvae kill the buds, which turn brown and fall. The whole fruiting shoots were also killed.

The year's crop was lost and the trees seriously crippled. A description of the moth and its distribution are given and notes on the life-history. Reference is also made to another nut feeding Tortrix—*Tortrix corylana*.

THEOBALD (F. V.). **The Large Cabbage White Butterfly** (*Pontia brassicae*) **and a simple method of control.** *Journ. S.E.A. Coll.*, July, 1928, No. 25, pp. 75-78.

Details of the seasonal occurrence of the Large White Butterfly and the food plants of its larvae are given, also the life-history and description of the various stages. Reference is made to the parasite, *Microgaster glomeratus*, which attacks the caterpillars. As a means of control experiments were made with common salt. It was found that 2 ozs. of common salt to a gallon of water, sprayed over the attacked Brassicae, entirely cleared the plants of the caterpillars. No damage was done by the salt to the plants. Leaf scorching resulted with nasturtiums, but not to stocks or geraniums, but its effect was not so good as on the Brassicae, owing to the difficulty of getting at many of the larvae.

THEOBALD (F. V.). **Notes on a new Mushroom Pest and on the control of *Sciara* larvae.** *Journ. S.E.A. Coll.*, July, 1928, No. 25, pp. 79, 81. figs. 7 & 8.

A serious attack of mushroom maggots in some large sheds in Sussex is recorded. Not only was the common Mushroom Maggot (*Sciara agraria*) present but much harm was done by the small white maggots of one of the Gall Flies (*Cecidomyidae*). These proved to belong to the sub-family *Heteropezinae* and probably to the genus *Miastor*. The larvae produced other larvae. No pupal stage was found, reproduction being entirely by Paedogenesis. The damage done by them to the spawn and buttons was very great.

Fumigation for *Sciara* larvae with sulphur and hydrocyanic acid gas was tried, but did not prove very successful, the best means of control being by placing pieces of glass, painted white, below and covered with Tanglefoot above, every few yards on the ridges. Midges were caught in vast numbers. The windows were also smeared with Tanglefoot. This reduced the pest (*Sciara*) very considerably.

The New *Cecid* pest is described in a note by Mr. H. F. Barnes (p. 81).

THEOBALD (F. V.). **Some Recent Advances in the Control of Insect Pests.** *Journ. Roy. Hort. Soc.*, July, 1928, vol. liii, pp. 2, pp. 201-219.

An account of recent methods of insect control given in the two Masters Memorial Lectures of the R.H.S. The subjects referred to are tar distillate washes, and the destruction of insect eggs on fruit trees. The methods adopted are traced from the earliest attempts to destroy the insect eggs, up to the use of tar distillates at the present time.

Big Bud in Black Currants and lime-sulphur dusting, the control of Apple Blossom Weevil by banding and the use of poultry are also dealt with.

The second lecture deals with poison baits for Leather Jackets and Cutworms; recent methods for wireworm control, the destruction of Woodlice in greenhouses by poison bait and the control of Red Spider under glass.

THEOBALD (F. V.). **Notes on Hop Insects in 1927.** *Entomologist*, June, 1928, vol. lxi.

An account of the chief hop insects observed in 1927. Amongst the most interesting are the Rosy Rustic Moth (*Hydroecia micacea*), the Strig Maggot (*Diplosis humuli*. Tolg.) which was very abundant in Herefordshire, a large

green Aphid (*Macrosiphum Gei* Koch), Needle Nosed Hop Bugs (*Calocoris fulvomaculatus* and Green Bugs (*C. bipunctatus*).

The Hop Flea (*Psylliodes attenuatus*) was noticed in large quantities on Nettles, where it hibernates.

THEOBALD (F. V.). Two Chrysanthemum Aphides new to Great Britain. *Entomologist*, March, 1928, vol. lxi, pp. 49-51, figs. 2.

Two chrysanthemum plant lice new to Great Britain found at Swanley are described, namely *Rhopalosiphum lahorensis* Das and *Capitophorus chrysanthemi* Theobald. The first had only been known previously in India and Egypt ; the latter was described from S. Africa and also occurs at Cairo.

THEOBALD (F. V.). A Potato Pest new to the S.E. Province. *Journ. Kent F. U.*, Aug., 1928, vol. xxiv, No. 2, pp. 64-66., and reprint, Aug., 1928.

An account of the Eelworm (*Heterodera schachtii*) attacking potatoes in Kent, Surrey and Sussex, being the first record of that worm in those counties.

Methods of control are suggested, including rapid clearing and burning of the plants on the affected areas and some others around them, deep cultivation and treatment of the soil with sulphate of potash at 3 cwt. to the acre.

THEOBALD (F.V.). The Value of Tar Distillate Washes. But still the necessity for Grease-Banding. *Journ. Kent F. U.*, Aug., 1927, vol. xxii, No. 4, pp. 64-66.

An account of the insects whose eggs are killed by tar distillate washes and reference to those partly controlled and those like Red Spider not affected.

It is pointed out that as not sufficient Winter Moth, March Moth, etc., eggs are destroyed, Grease Banding is still necessary.

THEOBALD (F. V.). Three Aphids New to Great Britain. *Entomologist*, Jan., 1928, vol. lxi.

The description of a new species *Macrosiphoniella triglochiniella* on Sea Arrow Grass ; an *Aphis*, *A. palustris* on *Triglochin palustris*, and a *Neoacaudus* on *Artemisia vulgaris*.

THEOBALD (F. V.). Some West Indian Aphides. *Ent. Month. Mag.*, July, 1928, vol. lxiv, p. 153.

A list of Aphides so far known in the West Indies.

WIMSHURST (F.). Preliminary Notes on the Cherry Fruit Moth (*Argyresthia nitidella*). *Journ. S.E.A. Coll.*, July, 1928, No. 25, pp. 86-89, figs. 4.

A description of the eggs, larva, cocoon and adult Moth, dates of appearance and notes on preventive measures.

UNIVERSITY COLLEGE OF WALES, ABERYSTWYTH.

JENKINS (J. R. W.). Seed Treatment as a means of preventing Turnip Flea Beetle attack. *Welsh Journ. Agric.*, 1928, vol. iv.

A series of experiments was carried out both in the laboratory and in the field in order to ascertain the value of steeping swede seed in paraffin or in

turpentine prior to sowing, in preventing flea beetle attack. The effect of the treatment upon germination was also noted.

It was demonstrated that the treatment had no adverse effect either upon energy of germination or on total percentage germination.

Field experiments showed that the treatment, under favourable conditions, does achieve a very appreciable degree of control, and in view of the small cost and little labour involved may be recommended for inclusion in ordinary farming routine.

JENKINS (J. R. W.). **Carbolineum Spray Trials in Wales.** *Welsh Journ. Agric.*, 1928, vol. iv.

Trials were carried out at seven centres in Mid-Wales. The value of the sprays used was clearly demonstrated. Practically complete control of fruit tree aphides was obtained, Apple Sucker infestations being too light to permit accurate data being obtained. The control of Winter Moth Larvae was negligible, and no apparent control of Tortrix larvae was obtained.

UNIVERSITY COLLEGE OF NORTH WALES.

WALTON (C. L.). **Note on the Activities of Humble Bees (*Bombus*) in North Wales.** *Ann. App. Biol.*, Nov., 1927, vol. xiv, No. 4.

A short account is given of the humble bees observed in North Wales and adjacent districts during the period 1919-27, with notes on their relative abundance and seasonal activities. The chief economic plants visited by each species are listed, together with brief mention of those cultivated and wild flowers most favoured. Fifteen species of Bombi are dealt with.

WALTON (C. L.). **Some Experiments for the Control of Mangold Fly.** *Welsh Journ. Agric.*, 1928, vol. iv, pp. 347-350.

The Mangold Fly (*Pegomyia betae*) has, during recent years, caused serious injury in North Wales, particularly to seedling plants. Preliminary control experiments included (1) dusting, (2) spraying and (3) rolling at several centres.

(1) Applications of green tar oil and nicotine sulphate dusts were not successful in deterring attack.

(2) Spraying with paraffin emulsion or nicotine sulphate did not injure plants and, applied as soon as the seedlings were up, afforded a very considerable degree of protection. A spray of Bordeaux mixture was not successful.

(3) Rolling gave good results and seems to offer a reasonable and effective method of control. If carried out before "singling" no harm was done to the plants.

WALTON (C. L.). **Some Observations on the Fluctuations of Certain Injurious Species—with special reference to North Wales.** *North West. Nat.*, June & Sept., 1928, pp. 7.

A number of instances of fluctuation in some Agricultural pests (and other species) are given, based on some fourteen years' experience of Zoological Survey work in Mid and North Wales, together with some extracts from recent literature, bearing on the subject. Amongst the species cited are *Eimera stiedae*, *Fasciola hepatica*, *Ixodes ricinus*, *Anuraphis helichrysi* and other Aphides, *Plutella cruciferarum*, *Lucilla* spp., *Pegomyia betae* and *Hypoderm* spp.

UNIVERSITY COLLEGE OF SOUTH WALES.

THOMPSON (H. W.). **Further Tests of Poison Baits in South Wales.** *Welsh Journ. Agric.*, 1928, vol. iv.

Results of trials of a number of substances for use with bran as poison baits against leather-jackets, surface caterpillars and slugs. Of the substances tried copper sulphate proved ineffective, derris powder gave moderate results and sodium fluosilicate promising results.

THOMPSON (H. W.). **Carbolineum Spray Trials in Wales. (Trials in South Wales.)** *Welsh Journ. Agric.*, 1928, vol. iv.

Describes the results obtained at six centres in South Wales with three proprietary tar distillate washes.

NORTH OF SCOTLAND COLLEGE OF AGRICULTURE.

MORISON (G. D.). **The Muscles of the Adult Honey-Bee. Part I. The Healthy Muscles of the Adult Honey-Bee. Somatic Musculature.** *Quart. Journ. Micros. Sci.*, Dec., 1927, vol. lxxi, pp. 395-463.

The somatic musculature is described for the three castes of honey-bee. Each muscle is named and considered physiologically. The histology of muscle-fibres is described. Histological measurements of healthy tissues are given throughout the paper. The physiology and histology of the nervous system in relation to the musculature are discussed, and nerve-endings on muscle-fibres are described. The mechanics of respiratory movements, the course of air through the tracheae, and the physiology of respiration are considered. The tracheation of muscle receives histological description.

MORISON (G. D.). **The Muscles of the Adult Honey-Bee. Part II. The Healthy Muscles of the Adult Honey-Bee. Muscles of the Alimentary Canal, Heart, Diaphragms, and the Reproductive Organs, and the Indirect Muscles of the Wings.** *Quart. Journ. Micros. Sci.*, Apr., 1928, vol. lxxi, pp. 563-651.

The entire musculature of the alimentary canal, heart, dorsal and ventral diaphragms, reproductive organs, and the indirect muscles of the wings, is described morphologically and histologically as well as with regard to innervation, tracheation and physiology in the three castes of bee. The attachment of muscle is described. Throughout the paper histological measurements are given for the various types of muscle fibres.

MORISON (G. D.). **Observations and Records for some Thysanoptera from Great Britain. I. With a description of *Odontothrips cytisi*, sp.n.** *Ent. Month. Mag.*, Feb., 1928, vol. lxiv, pp. 37-45.

Notes on the systematics, biology and distribution of six species of *Odontothrips*.

MORISON (G. D.). **Observations and Records for some Thysanoptera from Great Britain. II. Some *Oxythrips*.** *Ent. Month. Mag.*, July, 1928, vol. lxiv, pp. 159-171.

Notes on the systematics, biology and distribution of seven species of *Oxythrips*.

MORISON (G. D.). **Observations and Records for some Thysanoptera from Great Britain. III. *Chirothrips manicatus*, Hal., and *Limothrips* spp.** *Ent. Month. Mag.*, Aug., 1928, vol. lxiv, pp. 189-196.

Notes on the systematics and biology of some species of Thysanoptera injurious to cereals and grass.

ROBERTSON (D.). **Observations on the Disease of Oats caused by the Stem Eelworm *Anguillulina dipsaci*.** *Ann. App. Biol.*, Aug., 1928. vol. xv, no. 3, pp. 488-498.

This paper deals with some observations on the biology of the stem eelworm obtained during investigations in the eelworm disease of oats in the North of Scotland. The life history of the parasite is described and results are given of the numbers of eelworms found in infected soils. The external symptoms of diseased oat plants are described in detail. It is definitely proved that *A. dipsaci* can infect the oat panicle and grains and remain there in a quiescent state within the harvested seed.

(6) MYCOLOGY AND VIRUS DISEASES OF PLANTS.

NATIONAL INSTITUTE OF AGRICULTURAL BOTANY, CAMBRIDGE.

BRYAN (H.). Wart Disease Infection Tests. *Journ. Agric. Sci.*, vol. xviii, pt. 3, 8 pp.

A description of the successful adaptation, for use on a practical scale, of a method originally indicated by Miss Glynne for determining indoors the reaction of potatoes to wart disease by infecting the young sprouts with summer sporangia. The article describes the technique, the results obtained at the Potato Testing Station, Ormskirk, the provision of infective material, and the advantages of this method over field tests as regards economy of space and time and increase of reliability.

HORTICULTURAL RESEARCH STATION, EAST MALLING.

AMOS (J.), HATTON (R. G.), KNIGHT (R. C.), MASSEE (A. M.). **Reversion in Black Currants: Its Cause and Eradication.** *E.M.R.S. Ann. Rep.*, May, 1928 (15th year), 1927, I. General.

This is a summary of the findings published in earlier papers.

AMOS (J.) & HATTON (R. G.). **Reversion in Black Currants. Part II.** *Journ. Pom. & Hort. Sci.*, 1927-8, vol. vi, pp. 282-295.

Detailed observations upon a plot of 679 black currant bushes which had been lime sulphur sprayed annually, and had surgical methods applied also, offer no definite evidence of the spread of reversion from bush to bush within the plot during the first four years.

A rapid spread of the disease subsequently can be traced to an exceptionally heavy centre of reversion and big bud in close proximity.

Under these latter conditions, the single spring lime sulphur spraying has proved insufficient to stem the tide of such continuous heavy infection.

The intensity of the disease and its progress have been very variable from bush to bush. In some cases the apparent development is astonishingly rapid, in others comparatively slow.

The frequent replanting of healthy bushes in the place of diseased ones which have been removed does not suggest that infection is carried through the soil.

When minor portions of bushes have shown disease, surgical methods have been applied, and though in exceptional instances the removal of reverted portions has resulted in at least a temporary "cure," in the vast majority of cases the disease has not been materially checked within the individual bush thereby.

On the other hand, the cutting away of diseased parts and the removal of wholly infected bushes are to be urged as sanitary measures.

The incidence of reversion in the cutting bed has been studied. The danger of taking cuttings even from apparently healthy portions of diseased bushes is demonstrated. On the other hand, in no instance has a healthy bush resulted from the planting of a reverted cutting.

The promising results of applying "roguing" methods (as detailed in Part I of this paper) to the parent bushes and subsequent cutting beds are set forth after four years' trial.

HARRIS (R. V.). **Raspberry Cane Spot and its Control.** *E.M.R.S. Ann. Rep.*, 1927 (I General), pp. 57-63.

The control measures recommended are:—

A.—The New Plantation.

1. Avoid planting up very susceptible varieties.
2. If a very susceptible variety such as *Baumforth Seedling B* is selected or if the canes for planting show any trace of spotting, cut all the cane back as hard as possible directly after planting, and burn the cane thus cut away.

B.—The Established Plantation.

1. Cut out and burn all the most badly cankered and spotted canes during the spring thinning of the stools.
2. Spray with lime sulphur (a delayed dormant application at 1 in 10 and a pre-blossom application at 1 in 40).
3. Cut out and burn, as soon after cropping as possible, all the old fruiting canes.

WORMALD (H.). **The Parasitism of the Hop Leaf-spot fungus** *Cercospora cantuariensis*. *Trans. Brit. Mycol. Soc.*, 1928, vol. xiii, pp. 32-39.

Inoculation experiments have shown that the fungus *C. cantuariensis*, found in 1922 associated with a leaf-spot of hop plants in a commercial hop garden at Canterbury, is the primary cause of the disease. Under experimental conditions infection could be induced by means of inoculations with mycelium from plate cultures or with conidia from infection spots. Conidia, placed on leaves of hop plants in moist air, infected the leaves directly and typical spots appeared within a few days. Severe infection sometimes caused premature leaf-fall.

LONG ASHTON FRUIT RESEARCH STATION AND UNIVERSITY OF BRISTOL.

BARKER (B. T. P.). **Investigations on the Fungicidal Action of Sulphur (Progress Report).** *Ann. Rep. Agric. & Hort. Res. Stat.*, 1927.

In this progress report evidence is adduced which has led to the conclusion that the automatic dispersion of sulphur through space, which has been recognised generally by workers on this fungicide, occurs at ordinary temperatures by the emission of minute solid particles of sulphur and not in the form of a gas or vapour. The "particulate" form appears to be analogous to similar cases previously known to occur in certain other elements, e.g., gold and arsenic.

It is further shown that sulphur in contact with young leaves of a wide range of plants is reduced with the ultimate formation of a gas, which gives the reactions of hydrogen sulphide. This reaction appears to occur only on the side of the leaf bearing stomata. A similar reaction occurs when sulphur is applied to the actively growing mycelia of some fungi.

Reference is also briefly made to the results of further work, as yet unpublished, indicating that sulphuretted hydrogen is highly toxic to fungi and that accordingly the fungicidal action of sulphur is probably attributable in part, if not entirely, to the formation of this substance under the conditions indicated.

NATRASS (R. M.). **Report on Bunt Prevention Trials, 1927.** *Ann. Rep. Agric. & Hort. Res. Stat.*, 1927, pp. 104-106.

Little Joss wheat seed artificially contaminated with bunt (*Tilletia tritici*) and treated with 40 per cent. solution of formaldehyde (1 in 320), 2.5 per cent.

copper sulphate solution, or copper carbonate powder 2 oz. per bushel, was planted in three Wiltshire wheat fields.

In the first area these treatments gave 0, 0.19, and 0.42 per cent. bunted heads, respectively, as compared with 18.11 per cent. in the untreated control; in the second area the figures were 0, 0, and 0.09 per cent., respectively, with 10 per cent. in the control, while in the third area they were 0.76, 0.15, and 0.73 per cent., respectively, and 17 per cent. in the control.

NATTRASS (R. M.). **The Occurrence of *Phacidiella discolor* Pot. in the Bristol Province.** *Ann. Rep. Agric. & Hort. Res. Stat.*, 1927, pp. 99-100, 1 pl.

During 1927 *Fuckelia conspicua* was observed in Worcestershire causing all stages of bark canker on 15- to 20-year-old Red Robin pear trees which had long borne heavy crops. Conidial fructifications of the fungus identical with those seen on apple trees in 1926 were present on the younger cankers, and abundant apothecia agreeing with *Phacidiella discolor* were found on the older ones. Monospore cultures from ascospores and conidia were identical and produced pycnidia containing conidia similar to those found in nature.

Inoculations of healthy young trees with pure cultures of the fungus gave negative results.

NATTRASS (R. M.). **Advisory Report in Economic Mycology.** *Ann. Rep. Agric. & Hort. Res. Stat.*, 1927, pp. 202-212.

During 1927, apple mildew and American gooseberry mildew were again very serious in the Bristol province.

Leaf spot of black currants (*Pseudopeziza ribis*) almost completely defoliated many acres of the Baldwin variety, but Davidson's Eight and Edina were markedly resistant; hard pruned bushes of Baldwins showed considerable resistance to the disease.

Plums attacked by *Fusicladium carpophilum* were received from Worcestershire.

Raspberries at Long Ashton were damaged by powdery mildew (*Sphaerotheca humuli*), Northumberland, Thornless, Fillbasket and Baumforth E being most susceptible.

A leaf spot of walnut trees caused by a species of *Marssonina*, not *M. juglandis*, was observed at Long Ashton and a bacterial die back of the same host in Herefordshire.

In addition to the *Physalospora* disease of willows, scab (*F. saliciperduum*) was observed at Long Ashton; *Diaporthe spina* occurred on diseased rods but its parasitism was not ascertained.

NATTRASS (R. M.). **The Control of American Gooseberry Mildew: Trials with Sulphur in the Bristol Province.*** *Journ. Min. Agric.*, 1928, vol. xxxv, pt. 2, pp. 161-167.

During 1927, a colloidal sulphur spray and several forms of sulphur dusts were tested against the standard ammonium polysulphide treatment.

In the first test, with Whinham's Industry bushes, the treatments, and the percentages of mildew following, were:—Ammonium polysulphide applied April 27th—17.6 per cent.; Colloidal sulphur applied April 27th—10.2 per cent.; Flowers of sulphur applied April 27th and May 26th—5.8 per cent.; Control (no treatment)—69 per cent.

* Part of this paper was published under the title of "Further Experiments on the Control of the American Gooseberry Mildew, Season 1927," in *Ann. Rep. Agric. & Hort. Res. Stat.*, Long Ashton, 1927, pp. 101-103.

In the second experiment each plot was treated on April 13th and May 10th. The treatments and the percentages of mildew following were:—Colloidal sulphur, 6·7 per cent.; amberene, 6·4 per cent.; flowers of sulphur, 3·1 per cent.; ground sulphur, 1·0 per cent.; green sulphur, 1·6 per cent.; control, 54·5 per cent. It is concluded that each of the forms of powdered sulphur used will give effective control.

Summing up the results of three years' experiments, the author emphasises the fact that the best time for the first application of spray or powder is the pre-blossom stage.

MARSH (R. W.) & NATTRASS (R. M.). **Investigations on Die-back of Fruit Trees. I. A Preliminary Experiment and some Field Observations on *Diaporthe perniciosa* as a cause of Die-back of Plum Trees.** *Ann. Rep. Agric. & Hort. Res. Stat.*, 1927, pp. 93–98.

In August, 1926, sixteen Czar plum trees were inoculated with *Diaporthe perniciosa*. Infection took place and small cankers were formed in thirteen trees, but by October 1st growth of the cankers stopped. Microscopic examination showed that by the formation of gum and suberised cells the tree had almost completely isolated all the infected tissue.

Field observations show that trees suffering from die-back may be grouped as follows:—(1) Trees up to six years of age under apparently healthy conditions. These are usually affected in the head and upper portion of the main stem; often they are growing on light soils of the type associated with leaf scorch. From these trees strains of *D. perniciosa* were isolated showing differences in cultural characteristics. (2) Old trees making little or no growth. Such trees show abundant dead wood on which *D. perniciosa* and *Dermatea prunastri* are found: *Fomes pomaceus* is also common on such trees, but the primary cause of die-back has not been determined. (3) Trees of all ages weakened by readily ascertainable factors, such as waterlogging, too deep planting, or attacks by *Armillaria mellea*.

NATTRASS (R. M.). **The *Physalospora* Disease of the Basket Willow.** *Trans. Brit. Mycol. Soc.*, 1928, vol. xiii, pt. 4, pp. 286–304.

This paper records the results of an investigation of the *Physalospora* disease of basket willows in the Somerset willow-growing district.

Symptoms of the disease are blackening of the leaves, die-back of the young shoots and formation of lesions or cankers on the rods. No fructifications have been seen on the leaves, but perithecia of a species of *Physalospora* and acervuli of a species of *Gloeosporium* occur on the rods. The connection between these forms has been shown by cultural work.

The ascospores and conidia germinate with the production of appressoria. Inoculation experiments show that the fungus is actively parasitic, directly infecting uninjured leaves and growing tips, and afterwards growing down into the main stem.

The fungus is provisionally regarded as *Physalospora Miyabeana* Fukushi, but the question of its affinity to the genus *Glomerella* arises.

Control measures, based on laboratory experiments, consist of covering the leaves with a protective fungicidal layer.

TUTIN (F.). **A Biochemical Note with Respect to an App'e Tree affected by "Silver Leaf."** *Ann. Rep. Long Ashton Res. Stat.*, 1927, p. 91.

It has previously been shown (*Biochemical Journal*, 1925, vol. xix, p. 414) that the leaves borne by a branch of an apple tree affected by "silver leaf" disease contained an appreciably lower proportion of pectin than did leaves taken from a healthy branch of the same tree.

The diseased branch of the tree in question has now recovered from the "silver leaf" and it has been shown that the pectin content of the leaves borne by it has been restored to a normal amount.

ROTHAMSTED EXPERIMENTAL STATION.

BRIERLEY (Wm. B.). **The Micro-Flora of the Soil.** *Journ. Queckett Micros. Club*, 1928, Ser. 2, vol. xvi, No. 94, pp. 9-19, 1 pl.

An account is given of the results of recent work on the algae, bacteria and fungi of the soil, the lines of investigation at present being explored and the viewpoints developing as a result of these studies.

BRIERLEY (W. B.). **The Control of Plant Diseases.** *Ann. App. Biol.*, 1927, vol. xiv, pt. 4, pp. 549-563.

A discussion of some modern tendencies and points of view regarding the wider aspects of the investigation and control of plant disease. The topics considered include the scope of the science of plant pathology; the training and supply of men; the types of research centres, their mutual relationships, their finances and the work each type can best carry out; the principal fields of disease research with the more immediately important problems; methods for the exploration of the several larger issues; methods for the popularisation and application of knowledge concerning plant disease and their relative values; and, finally, the ideals of plant pathology as a science.

BRIERLEY (Wm. B.), JEWSON (S. T.) and BRIERLEY (M. F.). **The Quantitative Study of the Soil Fungi.** *Trans. 1st. Internat. Cong. Soil Sci.*, 1927.

The plate dilution method for the estimation of soil fungi is analysable into its constituent factors under the following headings.

(1) Factors of Sampling; (2) Factors of Suspension; (3) Factors of Disintegration; (4) Factors of Dilution; (5) Factors of Plating; (6) Factors of Incubation; (7) Factors of Counting; (8) General Observations.

Each factor has been intensively studied as a unitary varying factor and in combination with other varying factors. It is shown that the estimation of the fungi per gram of soil varies with variance in each individual factor so that any single estimation is of only relative value. If, however, the factors throughout the technique be critically standardised and a particular sequence of operations rigidly adhered to, replicable data are obtainable.

CROWTHER (E. M.), GLYNNE (M. D.) and ROACH (W. A.). **Sulphur Treatment of Soil and the Control of Wart Disease of Potatoes in Pot Experiments.** *Ann. App. Biol.* 1927, vol. xiv, pt. 4, pp. 422-427.

Potatoes grown in infected soil treated with sulphuric acid and combinations of sulphur and calcium carbonate, were almost free from disease when the acidity of the soil was pH 3.4 or less.

Dressings of calcium carbonate, alone or with sulphur, giving a soil reaction of pH 7.5 or more, also reduced infection.

Partial or complete suppression of disease obtained at lower acidities, where the effect on the disease was not closely related to the degree of acidity, supports the tentative conclusion that sulphur does not depend entirely on its effect in raising the acidity, but has also another mode of action.

McLENNAN (E.). **The Growth of Fungi in Soil.** *Ann. App. Biol.*, 1928, vol. xv, pt. 1, pp. 95-109.

Experimental evidence is brought to show that high plate counts of particular fungi bear no relation to their comparative growth or importance in the soil.

After drying soil in vacuo for 2-3 days, very few colonies of either fungi or bacteria are obtained on plates. Soil treated in this way and then inoculated with vegetative fungi and re-treated, shows the same result, whereas when inoculated with fungal spores numerous colonies develop on the plates. The results suggest that the soil fungi exist largely in a vegetative condition and are killed on desiccation.

BRISTOL ROACH (B. M.). **On the Influence of Light and of Glucose on the Growth of a Soil Alga.** *Ann. Bot.* 1928, vol. xlii, pt. clxvi, pp. 317-345.

With low and moderate intensity of illumination, the rate of increase of the growth rate of *Scenedesmus costulatus*, var. *chlorelloides*, in a mineral-salts medium, due to photosynthesis alone, appears to be directly proportional to the rate of increase in light intensity, until a certain illumination of optimum efficiency is reached; beyond this optimum successive increases in light intensity produce progressively smaller increments in growth-rate as the alga approaches more nearly to its maximum rate of growth.

With light of low intensity, when the rate of growth due to photosynthesis is low, the total rate of growth of the alga possible in a glucose medium is equal to the sum of the rates due to photosynthesis alone and to the maximum amount of glucose assimilable in the dark.

BRISTOL ROACH (B. M.). **On the Algae of some Normal English Soils.** *Journ. Agric. Sci.*, 1927, vol. xvii, pt. iv, pp. 563-588.

The number of individuals are not smaller at 4 inches than on the surface, and may be larger, but they decrease with greater depth.

The unmanured plot of Broadbalk contained the same main species but fewer individuals than the farmyard manured plot. Thirty-five species are described from each plot and are divisible into true soil forms and casuals. The same main types were obtained from Barnfield and a cottage garden, but the blue-green species were less conspicuous in both of these soils.

Many soil algae exist in a vegetative condition. Biological notes are made on the more important or interesting species.

ROACH (W. A.) and GLYNNE (M. D.). **The Toxicity of Certain Sulphur Compounds to *Synchytrium endobioticum*, the Fungus causing Wart Disease of Potatoes.** *Ann. App. Biol.* 1928, vol. xv, pt. 2, pp. 168-191.

The toxicity of sulphuric, sulphurous, dithionic, trithionic, tetrathionic, and pentathionic acids to *Synchytrium endobioticum* in soil was of the same order in each case at the same hydrogen-ion concentration. Their neutral salts were non-toxic. The toxicities of these acids are probably due to their hydrogen-ion concentrations.

Acidified solutions of sodium thiosulphate, sodium hydro-sulphite and sodium formaldehyde sulphonylate were about ten times as toxic as sulphuric acid, and their toxicity above that accounted for by hydrogen-ion concentration, is probably due to their thio-sulphuric acid.

Sodium hydroxide was slightly more toxic and persulphuric acid ten times as toxic as sulphuric acid; hydrogen peroxide, calcium polysulphide and sulphuretted hydrogen were only slightly toxic.

HENDERSON SMITH (J.). **Experiments with a Mosaic Disease of Tomato.** *Ann. App. Biol.*, 1928, vol. xv, pt. 2, pp. 155-167, 1 pl.

This mosaic disease is produced in tomato by a virus, possibly identical with Johnson's Tobacco Virus 6, which differs from ordinary tomato mosaic in the brilliance and intensity of its leaf-symptoms, but in other respects is as yet indistinguishable from it.

The filtered virus transmits the disease in dilutions of 1 in 10,000, retains its activity for a year at room temperature, and withstands heating for 10 minutes at 80° C. but not at 90° C. It is not inactivated by alcohol up to 90 per cent.

Attempts at cultivation of the virus outside the living plant are described; all were unsuccessful.

HENDERSON SMITH (J.). **The Transmission of Potato Mosaic to Tomato.** *Ann. App. Biol.*, 1928, vol. xv, pt. 4, pp. 517-528, 3 pl.

Inoculation with the foliage of normal potatoes produced no disease in tomato. Nine varieties of potato were tested.

Similar inoculation with foliage of mosaic potatoes produced a characteristic disease in tomato, which is transmissible back to potato again and to other solanaceous plants. Five varieties of potato were used, of which three had been tested in the experiments with normal foliage.

The virus is filterable, withstands high dilution and remains active on keeping for several months. It is less resistant to heat and alcohol than ordinary tobacco mosaic, but more resistant than the virus of the closely similar spot-necrosis disease obtained by Johnson in tobacco on inoculation with the foliage of normal potatoes.

STOUGHTON (R. H.). **The Influence of Environmental Conditions on the Development of the Angular Leaf Spot Disease of Cotton.** *Ann. App. Biol.*, 1928, vol. xv, pt. 3, pp. 333-341, 1 pl.

Using an infection chamber, which is fully described, in which air temperature and humidity were independently controlled, it was found that the serious disease of cotton caused by *Bacterium malvacearum* was inhibited by temperatures above 32° C. Below this temperature infection occurred at humidities over 80 per cent. relative saturation. At 70 per cent. relative humidity infection was slight at a temperature of 25° C. At lower humidities no infection was obtained at a temperature of 28° C. The evidence shows that humidity and temperature are inter-related factors in the sense that a change in one may allow of a change in the other without effect on the disease.

WELSH PLANT BREEDING STATION AND UNIVERSITY COLLEGE OF WALES, ABERYSTWYTH.

SAMPSON (KATHLEEN). **Comparative Studies of *Kabatiella caulivora* (Kirchn.) Karak and *Colletotrichum Trifolii* Bain and Essary, Two Fungi which Cause Red Clover Anthracnose.** *Trans. Brit. Mycol. Soc.*, March, 1928, vol. xiii, pts. I and II.

A detailed report is given of work carried out with two fungi which cause anthracnose disease of red clover. The question of synonymy is dealt with and the two species are compared in regard to such features as morphology, method of invasion and attack, and growth in pure culture. Results are given of resistance trials carried out with various species and strains of *Leguminosae*. Transmission of the disease by artificially contaminated seed of red clover was obtained with each fungus.

SAMPSON (KATHLEEN). **Disease of Grasses Caused by *Epichloe typhina*.** *Nature*, Jan. 21st, 1928, vol. 121, No. 3038, p. 92.

Propagation experiments with various species have shown that *Epichloe typhina* persists from year to year as an intercellular parasite in the leaves and stems of perennial grasses. Work with *Festuca rubra* carried out in the field and laboratory indicates that this fungus is also a seed-borne disease. A parallel is suggested with the endotrophic parasite of the genus *Lolium*. Further work is in progress.

DAVIES (D. WALTERS), GRIFFITH (MOSES) & EVANS (GWILYM). **Finger and Toe Experiments in Mid-Wales, involving the Use of Resistant Varieties of Swedes.** *Welsh Journ. Agric.*, 1928, vol. iv.

The superior resistance of the Danish strains of swedes, Studsgaard, Hernig and Wilhelmsburger is very marked in all the experiments. They are not, however, altogether immune, but the degree of infection of some of the strains is very slight when compared with some of the most popular British varieties included in the trials. Although the Danish strains give a higher yield on infected land they are consistently outyielded by the British varieties on healthy land. The importance of strain is discussed and there is evidence to suggest that the source of seed is equally significant.

SEED TESTING AND PLANT REGISTRATION STATION, CORSTORPHINE.

ALCOCK (N. L.) & MARTIN (M. S.). **A Seed-borne Disease of Clover (*Trifolium repens* L.).** *Trans. and Proc. Bot. Soc. of Edin.*, vol. xxx, pt. 1, pp. 13-18.

In 1927-28 clover seed from Central Europe and from New Zealand was received at the Seed Testing Station, Edinburgh, infected by a fungus carried by a mat of resting mycelium below the seed coat.

This fungus was placed in culture and carried out its life-history, producing, first, small black sclerotia, and from the sclerotia a crop of pinkish-brown apothecial cups. The ascospores produced in the cups reproduced the fungus. The average size of the asci was 186 μ , and of the ascospores 16.8 μ . The fungus agreed in size of asci, ascospores, and general life-history with that known as *Sclerotinia trifoliorum*, but the size of the apothecia was smaller. In nature the size of the apothecia is exceedingly variable, but the cups throughout have followed a range of size below that of *Sclerotinia trifoliorum*.

One instance of reinfection and recovery has been noted.

~~LAUDER (A.), BERRY (R. A.) & HENDRICK (J.).~~ **Laboratory Wart Disease Tests.** *B.O.A.S. Misc. Pubs.*, No. 8.

A description is given of a routine method of testing potato seedlings under laboratory conditions for their susceptibility to Wart Disease. Results for the season 1926-27 of the application of the test to more than 3,000 seedlings and known varieties are stated and analysed. A comparison of results of laboratory and field testing of certain varieties is also given.

There is a note on the subject of proliferations simulating the excrescences caused by Wart Disease.

ARMSTRONG COLLEGE, NEWCASTLE-ON-TYNE.

BENNETT (F. T.). *Cladosporium herbarum* Lk.; its Parasitism and its Relation to "Thinning-out" and "Deaf Ears" in Wheat. *Ann. App. Biol.*, May, 1928, vol. xv, No. 2.

Considerable loss in the wheat crops in the north of England is occasioned by the falling of plants after heading out ("thinning out"), and bleached plants which bear no grain, or if of normal colour, bearing a few small shrivelled grains ("deaf ears"). This state is frequently attributed to *Cladosporium herbarum*, which is present to some extent upon the haulm or ears, and is frequently the only organism visible on the aerial parts.

A large number of specimens of *Cladosporium* were isolated from the four common cereals, and all proved to be one or other of three strains of *C. herbarum*. Two other strains were isolated from Brassicas. The pathogenicity of all five strains was tested in parallel with a known parasite, the strains being in the normal (*Cladosporium*) and the bud-spore (*Hormodendron*) forms. None of these strains of *C. herbarum* was parasitic on cereals or brassicas, or caused the above-mentioned troubles of wheat.

BENNETT (F. T.). *Fusarium culmorum* (W. G. Sm.) Sacc. and *F. avenaceum* (Fries) Sacc. as Parasites of Cereals. *Ann. App. Biol.*, May, 1928, vol. xv, No. 2.

These two species of *Fusarium*, singly or together, were isolated with regularity from the bases of wheat plants which showed "thinning out" and "deaf ears" (see above), when no other parasitic fungi were present.

Experimental work showed that both species of *Fusarium* cause "seedling blight," "spring yellows," and "foot rot," and that the foot rot results in "thinning out," "whiteheads," and "deaf ears"; further, both species cause "head blight," which results in sterility of florets or diseased grains. Barley, oats and rye are also affected. Physiological and cultural studies of the fungi are described, and methods for controlling the disease are discussed.

BENNETT (F. T.). *Dematium pullulans* de B. and its Ascigerous Stage. *Ann. App. Biol.*, Aug., 1928, vol. xv, No. 3.

During an investigation of *Cladosporium herbarum* the fungus *D. pullulans* occurred in conjunction with it so frequently, and according to some investigators was merely another form of *Cladosporium*, that a study of the organism was undertaken. From the many isolations made, six definite strains were isolated. The special object of the investigation was to ascertain if this fungus played any part in causing certain diseases in wheat. Inoculation experiments proved that the fungus was essentially saprophytic, with weak parasitic capacity, and non-pathogenic to wheat. This nature and extent of its parasitism is probably similar for other host plants.

The six strains of the fungus were indistinguishable morphologically, but macroscopically in cultures showed such transition of characters as to be recognised as a series. One of these strains was derived from the ascigerous stage occurring naturally on wheat straw. From this was deduced the fact that *Dematium pullulans* de B. is the conidial stage of *Anthostomella pullulans* (de B.) comb. nov. It is not a polymorph of *Cladosporium*.

HARPER ADAMS AGRICULTURAL COLLEGE.

PRESTON (N. C.). Experiments on the Control of Finger and Toe in Cabbages by the Use of Mercuric Chloride and Other Substances. *Welsh Journ. Agric.*, 1928, vol. iv, pp. 280-295.

Consistently satisfactory control of finger and toe disease was obtained, over a period of three years, by the application of a 0.1 per cent. solution of mercuric chloride to cabbage seedlings at the time of planting.

The use of "uspulun" also gave reasonably good, though somewhat inferior results.

Other substances tested, including certain coal-tar dyes, proved quite ineffective in controlling the disease.

Inconclusive results were obtained by soil treatment with formalin and with a proprietary tar-oil product.

Further trials are in progress.

MIDLAND AGRICULTURAL COLLEGE.

STIRRUP[▼](H. H.) & CRANFIELD (H. T.). **Attempts to Control Bunt (*Tilletia tritici* Wint.) in Wheat with a Formalin-Gypsum Dust.** *Ann. App. Biol.*, May, 1928, vol. xv, No. 2.

In this paper the authors give an account of a series of experiments over a period of four years in which attempts are made to control Bunt in wheat by dressing heavily infected seed with a dry powder or dust composed of formaldehyde and calcined gypsum.

Good control was obtained in the first two years when clean seed, *artificially* infected with Bunt spores from crops of different varieties, was used.

In the last two years the seed was heavily infected *naturally* by Bunt spores obtained from the same crop. Under these conditions the formalin-gypsum powder exercised little or no control of Bunt.

The experiments seem to provide some evidence to support the view that *Tilletia tritici* is a fungus comprising a number of biologic forms.

STIRRUP (H. H.). **A Method of Preventing "Damping-off" in Celery Seedlings.** *Bull. Hort. Sub-Ctee, Lindsey C.C. Educ. Ctee.*

A short paper giving full particulars of a method of soil sterilisation in the frames which has been found after repeated experiments with various substances to give complete control of the damping-off diseases in celery seedlings. The paper is illustrated with a plate taken from a photograph of one of the soil sterilisation experiments in 1926. This plate shows one frame, treated soil, with a crop of healthy seedlings, and another frame, soil untreated, with a crop of seedlings badly damped-off.

STIRRUP (H. H.). **The Importance of Seed in Plant Diseases.** *Derbyshire Young Farmer*, May, 1928, vol. ix, No. 5.

A short discussion on the importance of seed in plant diseases illustrated by reference to Bunt in wheat, celery leaf spot, potato blight, and virus diseases in potatoes.

UNIVERSITY OF OXFORD.

WOODWARD (R. C.). **Bunt in Wheat. Copper Carbonate Dry Treatment of Seed.** *N.F.U.Yr.Bk.*, 1927; also *Farmer and Stockbreeder*, Jan. 2nd, 1928, p. 30.

Compared with the eleven dry and wet dressings used, copper carbonate, in 1925, was the most efficient in reducing infection and produced a plant not inferior to any. In 1926 copper carbonate reduced infection to 1 per cent. against the untreated 34 per cent. The percentage infection with formalin (1.640) and $2\frac{1}{2}$ per cent. and 10 per cent. copper sulphate, in this case, was nil. In 1927 the untreated seed developed 40 per cent. infected ears, whereas copper carbonate, $2\frac{1}{2}$ per cent. copper sulphate and formalin

(1-320) reduced infection to nil. In all cases copper carbonate produced as good or better plant than any other dressing.

The use of copper carbonate is recommended because of the many advantages it affords. Its special suitability for this country is pointed out.

SEALE-HAYNE AGRICULTURAL COLLEGE.

BEAUMONT (A.) & HODSON (W. E. H.). **Fourth Annual Report of the Department of Plant Pathology, Seale-Hayne College, Newton Abbot, Devon.** *Coll. Pamph.*, 1928, No. 25, 29 pp.

This pamphlet contains an account of the occurrence of fungal diseases in Devon and Cornwall during 1927, a list of diseases not recorded in the previous reports, and articles on the Control of Bunt, Strawberry Disease Investigations and a Trial of Swiss Potatoes for their resistance to Blight.

Root rot of Peas (*Aphanomyces euteiches*) is recorded for the first time in the south-west. American Gooseberry Mildew was unusually severe; washing soda gave the best control in a spraying demonstration.

Six different forms of Strawberry "Disease" are described and distinguished, viz., Miffy Plants, Small Leaf, Cauliflower, Red Plant, Leaf Curl and Patch. It is shown that the last two are responsible for most of the losses in the Tamar Valley.

All the Swiss varieties of potatoes tested were susceptible to Blight.

SOUTH-EASTERN AGRICULTURAL COLLEGE, WYE.

GOODWIN (W.) & MARTIN (H.). **Bordeaux Mixture in Combination with Arsenical Sprays.** *Journ. Agric. Sci.*, 1928, vol. xviii, p. 460.

A study was made of the chemical changes which take place when Bordeaux mixture is combined with (a) lead arsenate; (b) calcium arsenate. The enquiry fell into two sections, (1) the action of hydrated lime upon the arsenical compounds; (2) the effect of the addition of copper sulphate to the arsenical compounds and hydrated lime. The conclusions are drawn that in spraying there is a definite reduction of the risk of foliage injury when hydrated lime is added to lead arsenate or to calcium arsenate and that "equal-lime" Bordeaux mixture will, under certain conditions, prove far more effective than hydrated lime alone.

GOODWIN (W.), SALMON (E. S.) & WARE (W. M.). **Control of Apple Scab on Allington Pippin and Newton Wonder by two types of Bordeaux Mixture.** *Journ. Min. Agric.*, June, 1928, vol. xxxv, no. 3, pp. 226-235.

Similar plots of trees of Allington Pippin and Newton Wonder were sprayed three times with two kinds of Bordeaux mixture, (a) made with calcium hydrate, and (b) made with lump quick-lime. The fungicidal powers of the two mixtures proved to be identical and eminently satisfactory. The entire crop was graded by hand for the incidence of scab. In the control (unsprayed) plots the crop (2¾ tons) showed a percentage of 93 by weight of scab-affected apples in the Allingtons and of 86 in the Newtons. The sprayed trees (crop 5½ tons) showed a percentage of 12 of scab-affected apples in the Allingtons and of 13 in the Newtons.

GOODWIN (W.), SALMON (E. S.) & WARE (W. M.). **The Spraying of Cherry Orchards against "Leaf Scorch."** *Journ. S.E.A. Coll.*, 1928, vol. xxv, pp. 147-151.

The article describes the use of the Armada spray gun for spraying large trees, 30-40 ft. high, with Bordeaux mixture. A coarse or fine spray can

be obtained at will by turning a handle at the lower end of the 10 ft. rod. The first application of Bordeaux mixture (8 : 8 : 100) was on April 12th and the second on May 10th; the intended third spraying was not carried out owing to the danger of marking the fruit. No damage due to the spray resulted on the varieties Victoria Black, Waterloo, Frogmore and Amber. A slight bronzing of the foliage of Rivers was noticed and on Early Amber there was slight purple blotching and scorch at the edges of the leaves. In no case was there any leaf-fall due to the spray.

SALMON (E. S.) & WARE (W. M.). **Inoculation Experiments with the Downy Mildews of the Hop and Nettle** (*Pseudoperonospora Humuli* (Miy. et Taka.) Wils and *P. Urticae* (Lib.) Salmon et Ware). *Ann. App. Biol.*, Aug., 1928, vol. xv, no. 3.

The evidence is given which indicates that the Hop Downy Mildew is a distinct species coming from Japan, or possibly North America, into Europe about 1920. It is considered that it is more probable that the hop-gardens in the South-east of England became infected in 1924 by spores blown over from the Continent than that the contrary movement took place. Inoculation experiments have shown that *P. humuli* is capable of infecting and producing spores on *Urtica urens*, and that spores so produced can infect fully the Hop. No evidence was obtained as to whether it can establish itself permanently on *Urtica urens*. Zoospores of *P. humuli* placed on leaves of *Urtica dioica* and *Parietaria ramiflora* produced phenomena approaching sub-infection.

SALMON (E. S.). **The Downy Mildew of the Hop.** *Brewers' Journ.*, Jan. 15, 1928, vol. lxiv, no. 751, pp. 44-47.

A critical review is given of the important work on the Hop Downy Mildew published by Dr. Ctibor Blattny in the *Travaux des Instituts des recherches agron. de la Repub. Tchecoslovaque* (Prag) (1927). Confirmatory of the view that "regional forms" of the Mildew occur, it is mentioned that spores taken from cultivated hops proved unable to infect *H. japonicus* at Wye, whereas in Bohemia this species could be infected. Reasons are given for dissenting from several of the views held by Dr. Blattny, e.g., the existence of a saprophytic stage in the soil. It is suggested that the variety called the "Mid European Golding" (obtained from England) and stated by Dr. Blattny to have proved resistant to Downy Mildew in Bohemia and in Yugo-Slavia, may prove to be the Fuggles variety and not a Golding.

SALMON (E. S.). **The Control of the Hop Downy Mildew in Bavaria.** (*Ibid.*; No. 756, 299-300, June 15 (1928). (Reprinted in *Journ. Kent F. U.*, July, 1928, vol. xxiv, no. 7, pp. 24-29.

A review is given of articles concerning the Hop Downy Mildew and its control, published in Munich, in March, 1928, by Prof. Korff, Dr. Zattler and Regierungsrat Hampp. The suggestion is made that the organisation successfully established in Bavaria should serve as a model on which to frame measures for the national control of the disease in England.

SALMON (E. S.) & WARE (W. M.). **The Downy Mildew of the Hop, Wye :** *Department of Economic Mycology, S.-E. A. Coll.*, 28 pp., Dec., 1927. (Reprinted in *Journ. Kent F. U.*, Feb.-May, 1928, vol. xxiii, Nos. 2-5, pp. 67-70, 113-117, 156-161, 195-202.

In the introductory portion, the facts are given relating to the invasion of Europe in 1920 onwards by this new disease and to the damage it has caused. A detailed and illustrated account of the life-history of the fungus

is then given, with the diagnostic characters by which growers can recognise the disease on the leaves, shoots and cones. The course of the disease in 1927 in England and on the Continent is described, together with the facts relating to the resistance and susceptibility of cultivated varieties and an estimation of the losses caused in England. Under the control measures, instructions are given as to the best method of making and applying Bordeaux mixture.

SALMON (E. S.) & WARE (W. M.). **The Downy Mildew of the Hop in 1927.** *Journ. Min. Agric.*, Mar., 1928, vol. xxxiv, pp. 1093-1099:

An account is given of the incidence of the Hop Downy Mildew in 1927 in England, and of the resulting discoloration of the hop cones over a large acreage. The injuries caused to the affected crops are described, and estimates given, in certain cases, of the financial losses involved. The experience gained showed that the measures of control which may be sufficient in dry seasons are inadequate in wet, and need to be supplemented by spraying with Bordeaux mixture. Following a consideration of the sources of infection, a detailed account of the control measures now advocated is given. As regards the attack on the hop cones, certain varieties, *e.g.*, Bramling and Tolhurst, have proved to be especially susceptible, while the variety Fuggles, under conditions where it was severely tested, has proved to be practically immune.

SALMON (E. S.) & WARE (W. M.). **Inter-Specific Grafting in *Humulus*.** *Gard. Chron.*, June, 1928, vol. lxxxiii, no. 2162, p. 396.

Using the method of cleft-grafting described by the authors in 1925 (when different varieties of cultivated Hops were grafted on each other) experiments were made in which the annual species of Hop (*Humulus japonicus*) was grafted on the perennial species (*H. Lupulus*), and *vice versa*. No interaction of stock and scion was observed. It is considered possible that interspecific grafting may prove of value in the investigation of the virus diseases of the hop, if any of these diseases are found to be caused by two or more viruses at work in the same plant.

SALMON (E. S.) & WARE (W. M.). **The Mosaic Disease of the Hop ; Grafting Experiments. 1.** *Ann. App. Biol.*, Aug., 1928, vol. xv, no. 3, pp. 342-351.

Certain hop plants which were grafted in 1926 with scions, either (a) of plants affected with the mosaic disease, or (b) of the seedling variety "M45" (previously proved to be a "carrier" of the disease), produced, in 1927, shoots affected with mosaic disease.

Control plants, 81 in number, which were either grafted with healthy scions or left ungrafted, remained healthy. From the evidence available it would appear that the virus of mosaic disease can travel down a grafted stem and infect the root-stock. It would appear, further, that mere contact of a virus-carrying scion with the stock (with no growth of the scion taking place) is sufficient to cause the infection of the root-stock. In other experiments when scions of the commercial variety Fuggles were grafted on a hop plant severely affected with the mosaic disease they remained healthy and completed their full seasonal development.

WEST OF SCOTLAND AGRICULTURAL COLLEGE.

O'BRIEN (D.G.) & McNAUGHTON (E.J.). **The Endotrophic Mycorrhiza of Strawberries and its Significance.** *West Scot. Agric. Coll. Res. Bull.*, No. 1.

O'BRIEN (D.G.) & McNAUGHTON (E. J.). **Disease in Strawberries.**
Scott. Journ. Agric., vol. xi, No. 3.

The disease in strawberries, best defined as "root weakness" is a general one, being most acute in the Clyde Valley, where it is known as "The Lanarkshire Strawberry Disease." The only constant organism found on the living roots of unhealthy plants is an *endotrophic mycorrhiza* fungus of the type bearing vesicles and arbuscules. This fungus is regarded as a parasite and believed to be the fundamental cause of the disease which is generally slow-acting and chronic in its nature. The disease assumes really serious proportions when aggravated by conditions inimical to the growth of the strawberry plant. Methods of control are indicated.

(7) ANIMAL NUTRITION AND FEEDING STUFFS.

ANIMAL NUTRITION INSTITUTE, CAMBRIDGE.

DEIGHTON (T.). **The Relation of Fundamental Metabolic Research to Practice both now and in the Future.** *Pig Breed. Ann.*, 1928-29.

In this paper the real aim of such work is discussed and the points of contact with practice pointed out. Reasons are adduced why the scientific investigator should continue his present practice of returning his results in the scientific units in which they are obtained and illustrative computations are added showing how these may be converted in terms of lbs. of meal. Future prospects in this field are surveyed.

FOREMAN (F. W.). **Further Developments of Rapid Volumetric Methods for the Determination of Amino-acids, Organic Acids and Bases. I.** *Biochem. Journ.*, 1928, vol. xxii, No. 1.

Rapid accurate determination of ammonia or ammonia and volatile amines in fluids of biological interest, and the determination of the different classes of acid radicles represented in the total alcohol titration value.

On applying the alcohol titration method for amino acids (Foreman, 1920) exactly as if estimating amino acids alone, to fluids of biological interest, it is shown that the result represents accurately a collective measure of the acid radicles in amino acids, free acids, salts of ammonia or primary, secondary and tertiary amines. Hitherto such reliable total estimates have been unattainable. New methods which avoid undesirable changes in any of the constituents are described whereby these total values may be differentiated rapidly into class values and the accuracy of the estimates checked by balance sheet processes. New class estimates not hitherto possible are obtained. Consequently it is now possible to follow satisfactorily important changes occurring in foods, whether due to bacteria, enzymes or hydrolysis, during digestion and other physiological processes, in the growth of plants, in ripening and germination and in many other problems of agricultural, medical and hygienic importance.

FOREMAN (F. W.). **Further Developments of Rapid Volumetric Methods for the Determination of Amino-acids, Organic Acids and Bases. II.** *Biochem. Journ.*, 1928, vol. xxii, No. 1.

Rapid quantitative removal and determination of the carbonic acid radicle; especially in bacterial cultures, without exposing other constituents to risk of loss or change.

A new simple rapid room temperature process for estimating and eliminating the carbonic acid radicle from fluids such as bacterial cultures, based on the behaviour of the constituents in alcohol is described. An application of this method prior to those described in the foregoing paper (Foreman, 1918, 1) gives greater precision in the results of the latter and facilitates their interpretation. It seems possible that the new principle established in evolving this process will prove of much wider analytical usefulness.

FOREMAN (F. W.) & GRAHAM SMITH (G. S.). **The Changes produced in Meat Extracts by the Bacterium *Staphylococcus Aureus*.** *Food Invest. Spec. Rep.*, 1928, No. 31.

Application of the alcohol titration methods to investigation of the changes produced in meat extract media by bacteria, especially *Staphylococcus aureus*.

This investigation provides a demonstration of the usefulness of the new methods (Foreman, 1928, I, II) in studying changes occurring in biological fluids. The chemical changes produced by the bacterium during its growth in the meat extract under varying conditions have been followed over periods of incubation, in some cases very prolonged. Throughout the whole course of the experiments there is a remarkable correspondence between the fluctuations in the numbers of organisms and the alterations in chemical composition as determined by the methods. Full attention is given to the interpretation of the results and many features associated with the activities of this species of organism are brought to light for the first time.

FOREMAN (F. W.) & GRAHAM SMITH (G. S.). **The Control of Reaction in Cultures and Enzymic Digests.** *Food Invest. Spec. Rep.*, 1928, No. 32.

A comparison of the effects of certain salts upon changes in pH and changes in absolute $[H+]$ with reference to enzyme action. The role of creatinine in the control of reaction in cultures.

This paper deals with the important question of the control of the reaction in relation to the actions of natural agents such as bacteria and enzymes. The effects of the various constituents of meat extract media in this control are fully discussed. The effect of creatinine in the reaction control is elucidated for the first time giving rise to the suggestion that this substance produced from creatine in the body may exercise important physiological effects.

HAMMOND (JOHN). **Beef Production.** *Hereford Breed Ann.*, 1928.

In the production of any foodstuff there are generally two main factors to be considered, (1) quantity and (2) quality. In beef the first depends on the rate of growth in live weight and the second is mainly a matter of the conformation or changes in the proportions of the body with age. The main factors which affect the rate of growth in live weight are outlined and photographs are given showing how the conformation of the animal is affected by age, sex and by the method of feeding; by underfeeding the later developing and more valuable parts of the body suffer most.

HAMMOND (JOHN). **Selection for Meat Production.** *Verh. d. V. Internat. Kong. f. Vererbungswiss.*, Berlin, 1927 : *Z. indukt. Abstamm. u. Vererb. Lehre Supplbd.* 1928.

Just as size is a quantitative character and changes with age so also do the proportions of the body : photographs and weights of muscles and bones in sheep are given to illustrate this and other conclusions. Early maturity from a meat point of view means a quick change in the proportions of the parts. The improvement of the animal for meat consists in pushing forward the natural proportions of the body a stage further. Since the full capabilities of the animal for development are inhibited by under-nutrition, it would appear that selection of meat-producing animals can best be made under the optimal nutritional conditions.

HAMMOND (JOHN). **The Carcase Classes at Smithfield.** *Pig Breed. Ann.*, 1928-29.

Some observations and measurements of carcasses are given in an attempt to describe the butcher's requirements for a pork pig. Curves show that the best price per stone is given for a carcase of about 70 lbs. As the pig grows up it not only increases in size but changes in the proportions of its body, the extent depending on both breeding and feeding. Those pigs

which more nearly approached mature proportions at low body weight were those which were selected by the judges for prizes. The requirements for pork are mature proportions at small weights.

STEWART (J.) & WOODMAN (H. E.) (1) **The Mechanism of Cellulose Digestion in the Ruminant.** *Journ. Agric. Sci.*, Oct., 1928, vol. viii, pt. 4.

STEWART (J.) & WOODMAN (H. E.). (2) **The Transformation of Cellulose into Glucose by the Agency of Cellulose-splitting Bacteria.** *Journ. Agric. Sci.*, Oct., 1928, vol. viii, pt. 4.

Experiments are described which show that glucose is an intermediate product in the break-down of cellulose to organic acids and gases by cellulose-splitting bacteria. This observation throws further light on the physiology of cellulose digestion in the ruminant, and substantiates Kellner's finding on the food value of digestive fibre.

STEWART (J.) & WOODMAN (H. E.). **A short note on the Nutritive Value of Linseed Cake.** *Journ. Agric. Sci.*, Oct., 1928, vol. viii, pt. 4.

The nutritive value of linseed cake is calculated by the equation $R = M + GK$. From figures obtained from one animal existing under ideal experimental conditions and fed on a ration consisting solely of linseed cake, the result was found to be in entire agreement with that calculated by Kellner by the usual method of digestibility trials.

WOOD (T. B.). **The Nutritive Value of Swedes, Marrow Stem Kale, and Sugar Beet Tops.** *Journ. Min. Agric.*, Nov., 1927, vol. xxxiv, pt. 8.

This paper describes a method of computing the starch equivalent of swedes grown in Norfolk, swedes grown in the Fens, marrow stem kale and sugar beet tops from the results of feeding trials carried out in the field with sheep.

WOOD (T. B.). **The Value of Comfort in Pig Feeding.** *Pig Breed. Ann.*, 1928-29.

Instances are given where lack of room at the feeding troughs and defective ventilation of pig styes have caused restlessness which used up as much as two pounds of meal per pig per day.

WOOD (T. B.) & CAPSTICK (J. W.). **The Scientific Basis of Rationing Animals.** *Journ. Agric. Sci.*, vol. xviii, pt. 3.

The authors show that in general the equation $R = Am + gc$, where R is the ration consumed, A the area of the animal's skin surface, m the maintenance ration per unit of skin surface per day, g the daily gain in live weight and c the food required to make 1 lb. gain, holds in general for fattening and growing animals. They further show that the same equation may be used to find the value of m or c if the other terms are known. Instances are given in which both m and c have been evaluated from a number of equations by the method of simultaneous equations solved for the best values of m and c . Suggestions are made for using the equation for many other purposes.

WOOD (T. B.) & MANSFIELD (W. S.). **The maintenance and production requirements of Ewes and Lambs.** *Journ. Min. Agric.*, June, 1928, vol. xxxv, no. 3.

The production requirement of young lambs is determined by the method of comparative slaughter. The maintenance requirements of ewes and lambs are computed from the results of feeding trials.

WOODMAN (H. E.) & BEE (J. W.). **The Nutritive and Manurial Values of Sugar Beet Tops.** *Journ. Agric. Sci.*, 1927, vol. xvii, p. 477.

By means of digestion trials, it was shown that sugar beet tops constitute a feeding stuff of good digestibility, and that 25 lb. of such beet residues (containing 16·2 per cent. of dry matter) are able to replace 40 lb. of mangolds (containing 10·7 per cent. of dry matter) in the rations of stock. Samples of sugar beet tops were collected from a large number of East Anglian farms during the 1926 season and submitted to analysis. Fen-grown tops contained, on an average, 12·9 per cent. of dry matter, 0·31 per cent. of nitrogen, 0·06 per cent. of phosphoric acid and 0·43 per cent. of potash. The corresponding mean figures for all the other samples of tops were 17·2, 0·34, 0·11 and 0·58 per cent. respectively.

WOODMAN (H. E.) & AMOS (A.). **Maize Silage II.** *Journ. Agric. Sci.*, 1928, vol. xviii, p. 194.

It is demonstrated in this paper that the French variety of maize known as *Jaune Gros du Domaine* possesses all the characteristics essential to its success as a silage crop in the southerly counties of this country. In respect of composition, digestibility and nutritive value, the silage from *Jaune Gros* maize was somewhat superior to American maize silage, taking the average results of numerous investigations in that country for the purposes of the comparison. Compared on the dry matter basis its nutritive value is also superior to that of "green fruity" oat and tare silage.

WOODMAN (H. E.), NORMAN (D. B.), & BEE (J. W.). **Nutritive Value of Pasture. III. The Influence of the Intensity of Grazing on the Composition and Nutritive Value of Pasture Herbage (Part I).** *Journ. Agric. Sci.*, 1928, vol. xviii, p. 266.

The results of this investigation justified the conclusion that the dry matter of pasture herbage grown under a system of fortnightly cutting is a protein concentrate equal in digestibility and nutritive value to that obtained by weekly cutting. There is no significant running off of composition and feeding value during the second week of growth. At the end of a fortnight the herbage still consists of the same immature, non-liquefied tissue as it was at the end of a week's growth. Further, the grass retains its character of a protein concentrate, by systematic cutting at fortnightly intervals, over the entire season.

WOODMAN (H. E.) & CALTON (W. E.). **The Composition and Nutritive Value of Sugar Beet Pulp.** *Journ. Agric. Sci.*, 1928, vol. xviii, p. 544.

Dried sugar beet pulp must not merely be regarded as a substitute for roots in the ration. It is a carbohydrate concentrate of high digestibility, 1 lb. of which is capable of replacing 0·8 lb. of maize or 0·9 lb. of barley in the productive part of the rations of *ruminants*. From the standpoint of price per lb. or per unit of starch equivalent, dried sugar beet pulp is shown to be a cheap source of digestible carbohydrate in comparison with either maize

meal or barley meal. On the basis of a 10 per cent. moisture content, the manurial value per ton of dried sugar beet pulp is shown to be 9s.; that of molasses-sugar beet pulp 12s. 4d.

WOODMAN (H. E.). **Recent Advances in Animal Nutrition.** *Science Prog.*, Jan., 1928, No. 87.

An account of recent investigations in the domain of animal nutrition, dealt with under the headings: (1) The Food Requirements of Farm Animals, (2) The Theory of Cellulose Digestion in the Ruminant Organism, (3) Nutritive Value of Pasture.

WOODMAN (H. E.). **The Nutritive Value of Pasture Grass from the Point of View of Energy and Protein.** *Min. Agric. Misc. Pub.* No. 60, *Grassland Problems*. 1928, p. 14.

A reprint of the author's lecture to the Agricultural Organisers' Conference held at Cambridge in April, 1927.

WOODMAN (H. E.). **Monthly Notes on Feeding Stuff.** *Journ. Min. Agric.*, Oct., 1927, to Sept., 1928.

ANIMAL BREEDING RESEARCH DEPARTMENT, UNIVERSITY OF EDINBURGH.

CALDER (A.) with SMITH (A. D. BUCHANAN). **Pig-testing. The Results of Preliminary Work on Bacon Type.** *Scott. Journ. Agric.*, vol. xi, No. 3.

This is a report of experiments undertaken to get the method of slaughter records properly adjusted before the Pig Testing Scheme came into operation. It embraces an examination of the rate of development and economy of live weight gain, loss in transit, observations on the carcasses, palatability and cooking qualities.

PICKARD (J. N.). **The Influence of Certain Foods on the Wool Growth of Angora Rabbits.** *Scott. Journ. Agric.*, vol. xi, No. 3.

The addition of cod liver oil to the food appeared to increase the wool growth, but the addition of minerals appeared to have no beneficial effect.

NATIONAL INSTITUTE FOR RESEARCH IN DAIRYING.

DAVIES (W. L.). **The Deterioration of the "oils" of feeding stuffs.** *Fertiliser*, June 13th, 1928.

A review of the conditions likely to cause mustiness and rancidity in the "oils" of feeding stuffs.

GOLDING (J.). **On Raising Sucking Pigs by Hand at the National Institute for Research in Dairying.** *Pig Breed. Ann.*, 1928-29.

In raising sucking pigs by hand on cow's milk a frequent source of failure is indigestion, caused by a curd which accumulates in the stomach of the little pig and frequently results in death. The curd consists of fatty substances and casein.

The use of spray dried milks and mixtures of milk constituents which would not coagulate and in which the fat was well emulsified with traces of sodium bicarbonate gave good results in earlier experiments.

In later experiments, cod liver oil, well emulsified with a new commercial preparation and shaken with heated cow's milk, has proved a satisfactory diet for the raising of young pigs.

The principle involved is to avoid the formation of a cheesy clot in the stomach of little pigs. Acidity in milk which hastens the rennet test is specially to be avoided.

ROWETT RESEARCH INSTITUTE.

MAGEE (H. E.) & SOUTHGATE (B. A.). **A Method for Determining the Effect of Electrolytes in the Lumen of the Surviving Gut on its Movements.** *Journ. Physiol.*, 1928, vol. lxxv.

Description of an apparatus devised for studying the effect of ions on the inside of the surviving intestine.

MAGEE (H. E.), ANDERSON (W.) & GLENNIE (AGNES E.). **Some Observations on the Effects of Ether Anaesthesia on the Composition of the Blood and their Relation to Thyroid Function.** *Brit. Journ. Exp. Path.*, 1928, vol. ix, pt. 3.

The blood of rabbits was examined before and during ether anaesthesia in normal animals and in animals that had been fed dried thyroid or from which the thyroid gland had been removed previously. In normal animals, ether anaesthesia lowered the calcium and alkalinity but increased the phosphorus and sugar. The reaction tended to return to normal after a time.

Thyroid feeding raised and then lowered the sugar and diminished progressively the raising effect of ether on the blood sugar of anaesthetised animals. Thyroid feeding increased the phosphorus and diminished the alkalinity of the blood: effects which were accentuated by ether anaesthesia.

Thyroidectomy and thyroidectomy plus anaesthesia had variable effects on the reaction and on the phosphorus of the blood. The blood iodine was raised by thyroid feeding but lowered by thyroidectomy. It was not affected by anaesthesia.

ANDERSON (W.) & LEITCH (I.). **Note on the Effect of Anaesthetics on Blood Iodine.** *Lancet*, Dec., 1927, vol. ii, No. 5444.

Iodine estimations of blood before and after anaesthetics suggest that different anaesthetics affect the blood iodine.

GODDEN (W.). **Recent Advances in Animal Nutrition.** *Agric. Prog.*, 1928.

This is a review article showing the recent progress in the field of animal nutrition. It deals in particular with the latest work on "Vitamins" and with the rôle played in nutrition by the inorganic constituents of the food. Reference is also made to the work on the subject of pastures which is being carried out at Cambridge and Aberdeen.

HARVEY (D.). **The Effects of Cod Liver Oil on the Calcium and Phosphorus Metabolism of the Lactating Animal.** *Bioch. Journ.*, 1927, vol. xxi, No. 6.

The feeding of cod liver oil to goats was found to improve the assimilation of calcium by reducing the amount excreted in the faeces. The effect on phosphorus assimilation was variable. In late lactation the percentage and total amounts of calcium in the milk were increased. The iodine content of the milk was increased by feeding either cod liver oil or potassium

iodide. Cod liver oil had no effect on the fat content of the milk. Olive oil plus potassium iodide did not reproduce the effects of cod liver oil.

ORR (J. B.). **Milk Consumption and the Growth of School Children.**
Lancet, Jan., 1928, vol. i, No. 5448.

The results are reported of an experiment carried out at seven different centres in Scotland on the effect on health and growth of feeding milk to children during school hours. It was found that the giving of from $\frac{1}{2}$ to 1 pint of milk per day was followed by a definite increased rate of growth and that in most cases there was a marked improvement in the health of the children. This effect was obtained with either whole or separated milk, but the feeding of biscuits of equal energy value to the amount of separated milk had no beneficial effect.

ORR (J. B.), GODDEN (W.) & DUNDAS (J. M.). **Iodine in Drinking Waters.**
Journ. Hyg., Jan., 1928, vol. xxvii, No. 2.

Drinking water has long been supposed to play an important part in the causation of endemic goitre. The iodine content of waters from goitre and non-goitre areas has been estimated, but the results have shown that in this country there is no correlation between presence of goitre and a low iodine content in the drinking water. In several cases, the figures for water from recognised goitre areas are much higher than from non-goitre areas.

WOOD (T. B.), ORR (J. B.), CROWTHER (C.), and edited by DAVIDSON (H. R.). **Substitutes for Fish Meal in the Rationing of Pigs.**
Journ. Min. Agric., Aug., 1928, vol. xxxv, No. 5.

A series of joint experiments has shown that the value of fish meal for feeding to pigs as a supplement to a ration of cereals is associated with its protein and high mineral content. The oil appears to have no special value for growth but appears to have a slight depressing effect. Vegetable proteins, when used in the proper proportions and supplemented by mineral mixtures, give as good results as the animal protein in fish meal. Of the vegetable proteins used, extracted soya bean meal gave the best results.

WELSH PLANT BREEDING STATION, ABERYSTWYTH.

JONES (MARTIN G.). **Comparison of Pastures by Means of Sheep.**
Welsh Journ. Agric., Jan., 1928, vol. iv, p. 183.

A technique is described by means of which the grazing value of a *fresh temporary pasture* was compared with that of a *good permanent pasture* by measuring the increment in live weight of sheep. A comparison was also made of the response to the application of nitrogenous manures on each of the two pastures by the same method.

The experiment showed the superiority of the temporary pasture on the unmanured areas, whilst on the artificially manured areas a greater response to the application of nitrogen was also manifest in the case of the temporary pasture.

Data are also given on the following aspects:—

(i) Amount and composition of the fodder consumed by sheep when grazing on temporary and on permanent pastures.

(ii) Behaviour during twenty-four hours' observation of lambs on various pastures.

(iii) Effect of grazing on temporary and on permanent pastures.

SEED TESTING AND PLANT REGISTRATION STATION,
CORSTORPHINE

LAUDER (A.), BERRY (R. A.) & HENDRICK (J.). **Feeding Value of Swedes. Report of Scientific Sub-Committee.** *Misc. Publ. No. 8, Seed Test. and Plant Registr. Stat. First Rep.*

The investigations extended over a period of five years. A method for the determination of dry matter has been standardised.

Variation in dry matter is due to two causes—locality and variety.

A sheep feeding experiment with two varieties at three centres showed that other things being equal the comparative feeding value of varieties of swede can be expressed in terms of their comparative yield of dry matter *per acre*. There is, however, no significant difference in this respect between varieties. The differences in the dry matter content between varieties in the same group are also not significant.

(8) ANIMAL BREEDING (including Physiology of Reproduction).

ANIMAL NUTRITION INSTITUTE, CAMBRIDGE.

HAMMOND (J.) & MARSHALL (F. H. A.). **Oestrus and Pseudo-pregnancy in the Ferret.** *Proc. Physiol. Soc., Journ. Physiol.*, May, 1928, vol. lxx.

The ferret, which only sheds its eggs after coitus or the orgasm resulting from this, will in the absence of mating remain on heat from about March to August. If matings are made with sterile (vasectomized) males pseudo-pregnancy is produced, that is, changes are undergone by the uterus and mammary glands similar to those which occur in true pregnancy. It is concluded that the corpus luteum and not the follicle or oestrous hormone is responsible for mammary development.

WALTON (ARTHUR) & FAIR (T. KEITH). **Preliminary Investigation on the Fecundity of Premium Stallions.** *Journ. Agric. Sci.*, 1928, vol. xviii, pt. 4.

Seven "Premium" Stallions were examined during the breeding season of 1928. A sample of semen was obtained from a test mare and observations made on the number and activity of the spermatozoa. From these observations an estimate was made of the probable fertility of the stallion. Confirmation of the adequacy of this estimate will not be available until the actual foaling returns are available in the early summer of 1929, but it was found that not infrequently an apparently normal service was entirely or partially devoid of spermatozoa. This may be an important factor in determining the low fertility of certain stallions.

SMALL ANIMAL BREEDING RESEARCH INSTITUTE, CAMBRIDGE.

PEASE (M. S.). **Yellow Fat in Rabbits, a Linked Character?** *Verh. V. Internat. Kongr. f. Vererbungswiss. Berlin*, 1927, pp. 1153-1156.

While in most breeds of rabbits the fat is white, it was noticed that in a strain of Flemish the fat was of a deep yellow. Subsequent experiment showed that yellow fat behaves as a recessive character to white, but the relation is complicated by two peculiarities, viz.:—

- (1) In rabbits where the fat is genetically yellow the colour may remain white unless green food is fed to the animals. Biochemical examination showed the yellow colour to be due to xanthophyll, derived from the green food. Rabbits with yellow fat differ from those with white fat in that there is lacking in them some process of oxidation, probably in the liver, whereby the xanthophyll is broken up and prevented from reaching the tissues.
- (2) Up to the time of publication all albinos bred in the experiments had white fat. This was probably due to linkage between the factors for coloured coat and white fat, and this point is now being further tested experimentally.

PUNNETT (R. C.) & PEASE (M. S.). **Genetic Studies in Poultry. VI. The Gold Barred Rock.** *Journ. Genet.*, 1928, vol. xix, pp. 337-350.

The barring of the Gold Barred Rock, though in appearance somewhat similar to that of the Barred Chamois Campine, is genetically quite distinct,

and due, as in the Plymouth Rock, to a sex-linked barring factor. When transferred to breeds with dark plumage the action of the barring factor derived from the Gold Barred Rock exhibits certain differences as compared with that derived from the Plymouth Rock. It is less potent in inhibiting the development of both the gold and the melanic pigments. This lower potency of action also extends to the downs of the chicks. Chicks with brown downs rarely, if ever, show the characteristic light head patch when the barring factor present is derived from the Gold Barred Rock; whereas they almost always show it when the barring factor is derived from the Plymouth Rock. In genetical parlance the barring factor exists in two allelomorphic states, of which one is less potent than the other. The fact is of economic importance in view of the use made of the light head patch when breeding on sex-linked lines.

ANIMAL BREEDING RESEARCH DEPARTMENT, EDINBURGH.

CALDER (A.). **The Role of Inbreeding in the Development of the Clydesdale Breed of Horses.** *Proc. Roy. Soc. Edin.*, vol. xlvii, pt. 2, No. 8.

Wright's coefficient of inbreeding for 676 Clydesdale stallions was found and it was shown that the homozygosity of the breed relative to the foundation stock has been increased by 6.2 per cent. The greatest increase took place during the period 1880-1890, and the highest level was reached in 1920-1925. Apparently this is due to line-breeding being practised almost exclusively to members of one line of descent, viz., that of Darnley, together with careful selection.

CALDER (A.). **A Case of Partial Sex Transformation in Cattle.** *Proc. Roy. Soc. Edin.*, vol. xlvii, pt. 2, No. 17.

A case of sex transformation in an Aberdeen-Angus cow is described and the results of post mortem and histological examination given. It appears that the assumption of the male secondary sex-characters was a sequel to an infection of contagious abortion which brought about a cystic condition of the ovaries.

CHAUDHURI (A. C.). **A Study of Arginase Content in the Fowl with Special Reference to Sex.** *Brit. Journ. Exp. Biol.*, vol. v, No. 2.

This study was undertaken to test the work of Edlbacher and Röthler. The method used for detection and estimation of arginase was that employed by these workers. It was shown that there is no arginase in ovary or mature ova, but there is a significant amount in testes and vas deferens. No eggs examined showed the presence of the enzyme, although it was found in newly hatched chicks. Other organs examined showed no arginase present.

CHAUDHURI (A. C.). **The Iodine Content of the Thyroid of the Fowl with Reference to Age and Sex.** *Brit. Journ. Exp. Biol.*, vol. v, No. 4.

The iodine content of the thyroid of the sexually immature male fowl is lower than that of the thyroid of the sexually mature. The increase in iodine content is coincident with the attainment of sexual maturity as estimated by the histological picture of the testis.

In the case of the material used there was no indication of a sex dimorphism in the matter of iodine content.

The average percentage of iodine content of the thyroid of the bird is significantly higher than that of the mammal.

CREW (F. A. E.). **The Human Sex-Ratio.** *Edin. Med. Journ.*, Aug., 1927.

The numerical proportions of the sexes among newly-born infants—the secondary sex-ratio—is very nearly equality. In later life, however, the sex-ratio becomes much altered, the males being eliminated in larger numbers than are the females. It appears also that the primary sex-ratio or that at inception is very much higher, but this becomes reduced through the elimination of males until the ratio at birth is nearly equality.

CREW (F. A. E.). **Concerning Fertility and Sterility in Relation to Population.** *Proc. World Pop. Conf.*, 1927.

The different agencies which affect the reproductive rate of a population are considered. They are mainly environmental, not genetic, but genetic factors must be considered in relation to the hereditary constitution.

CREW (F. A. E.). **Genetical Aspects of Natural Immunity and Disease Resistance.** *Edin. Med. Journ.*, June, 1928.

The genetic basis of types and constitutions and the relation of these to susceptibility and resistance are examined. It is shown that certain dissimilarities are due to inborn impulses, that types, resistance and susceptibilities exist in fact.

CREW (F. A. E.). **Abnormal Sexuality in Animals. II. Physiological.** *Quart. Rev. Biol.*, vol. ii, No. 2.

Cases of intersexuality due to the over-riding of the genotype are described for the purposes of discussion as physiological intersexuality. Four influences which result in intersexuality are described and illustrated. These are (1) the action of foreign biochemical agency, (2) Parasitism, (3) Gonadectomy, (4) External agencies (including temperature and salinity).

CREW (F. A. E.). **Abnormal Sexuality in Animals. III. Sex Reversal.** *Quart. Rev. Biol.*, vol. ii, No. 3.

Cases of sex reversal are grouped under two main heads:

- (1) Those due to the direct expression of genetic action.
- (2) Those due to the over-riding of the genotype by agencies which sufficiently disturb the general physiological conditions of the zygote at some stage of its development.

These groups are systematically discussed.

CREW (F. A. E.). **Die Wirkungen der Schilddrüsenektomie am Hennengefiederten Hahn.** *Arch. f. Geflüg.*, Jahr. 1, Heft. 7.

The facts already known concerning the relation of gonads, thyroid and plumage can be accommodated by a hypothesis which postulates that the action of the gonads upon plumage is secondary to the effect of gonads upon thyroid. According to this hypothesis thyroidectomy in the hen-feathered cock should be followed by the assumption of cocky-feathering.

Thyroidectomy was performed upon hen-feathered Gold Campine cockerels and these later became cocky-feathered.

CREW (F. A. E.). **Studies on the Relation of Gonadic Structure to Plumage Characterisation in the Domestic Fowl. III. The Laying Hen with Cock's Plumage.** *Proc. Roy. Soc., B*, vol. ci, pp. 514-518.

The cock-feathered laying hen is a female, normal in every respect save that her plumage becomes as that of the agonadic bird following the moult,

as the result of a transient disfunctioning of the ovary (and/or of the thyroid) at this time.

CREW (F. A. E.). **Organic Inheritance in Man.** *Oliver & Boyd, Edinburgh.*

The subject matter of the William Withering Lectures, Birmingham University.

CREW (F. A. E.). **Heredity.** *Ernest Benn, London.*

A popular review of the subject.

CREW (F. A. E.). **The Influence of Internal Secretions on Sex Characters.** *Brit. Med. Journ.*, Sept. 17th, 1927.

The opening paper of a discussion in the Section of Physiology and Biochemistry at the Annual Meeting of the British Medical Association at Edinburgh.

CREW (F. A. E.). **The Relation of the Sex of Offspring to the Time of Coitus during the Oestrous Cycle.** *Brit. Med. Journ.*, Nov. 19th, 1927.

In an experiment designed to examine the sex ratio among individuals resulting from coitus during the first three hours and during the last three hours of oestrus respectively in the rat, no difference was noted between these two groups.

CREW (F. A. E.). **The Germplasm and Its Architecture.** *Nature*, Nov. 12th and 19th, 1927.

An evening discourse delivered at the Leeds meeting of the British Association on September 5th, 1927.

CREW (F. A. E.). **The Developmental Capon and Poularde.** *Proc. World's Poult. Conf., Ottawa, 1927.*

The cases of eleven sexually abnormal fowls are examined. These birds assumed the characters and behaviour of fowls completely gonadectomised before puberty. They differed from experimental capons and poulardes only by having combs which were bright and healthy, though diminutive. After being kept under observation for two or more years they were killed and it was found in every case that there was complete suppression or considerable reduction of gonadic tissue.

GREENWOOD (A. W.). **The "Hackleless" Fowl.** *Proc. Roy. Phys. Soc.*, vol. xxi, pt. 3.

An examination of specimens of the 'hackleless' variety of the fowl does not support the view held by some workers that the condition is an instance of the inheritance of an acquired *dermatitis erythematosa*. The condition appears to be genetic in origin and is based on the failure of the feather follicles to develop in certain well-defined areas of the body.

GREENWOOD (A. W.). **Studies on the Relation of Gonadic Structure to Plumage Characterisation in the Domestic Fowl. IV. Gonad Cross-transplantation in Leghorn and Campine.** *Proc. Roy. Soc., B*, vol. cxiii, pp. 73-81.

Implantation of testicular material from hen-feathered Campines into castrated Brown Leghorn males did not induce change in plumage character

from cock to hen feathering, although they produced normal male head furnishings. Apparently "hen-feathering" cannot be due to endocrine difference between two kinds of testes. Implants of testes from Leghorns into castrated hen-feathered Campines did not lead to change in plumage. It is suggested that this failure was due to an insufficient amount of testes, since head furnishings also did not develop to normal.

GREENWOOD (A. W.) with CHAUDHURI (A. C.). **An Experimental Study on the Effect of Thyroxin upon Sexual Differentiation in the Fowl.** *Brit. Journ. Exp. Biol.*, vol. v, No. 4.

Injections of thyroxin were made into the air space during the third day of incubation. Of the 190 eggs so treated 39 embryos survived, of which 12 were markedly affected by a reduction in size, but no effect on the processes of sex-differentiation was observed. The effects of the injection were not apparent before the eleventh day. No conclusions could be reached as to the relation between increased metabolism and the processes of sexual differentiation.

GREENWOOD (A. W.) with CREW (F. A. E.). **Studies on the Relation of Gonadic Structure to Plumage Characterisation in the Domestic Fowl. II. The Developmental Capon and Poularde.** *Proc. Roy. Soc., B*, vol. ci, pp. 450-462.

A series of eleven birds is described which throughout their life retained the characters and behaviour of individuals completely gonadectomised before puberty, except that their combs, though diminutive, were bright and healthy looking. Post-mortem examination revealed either complete absence or reduction in the size of the gonads. In such gonadic tissue as was present spermatogenesis was imperfect.

The causes of this gonadic imperfection are discussed. It has not yet been demonstrated whether the imperfection is inherent in the gonad or in the soma.

GREENWOOD (A. W.) with CREW (F. A. E.). **On the Quantitative Relation of Comb Size and Gonadic Activity in the Fowl.** *Proc. Roy. Soc. Edin.*, vol. xlvii, pt. 2, No. 4.

The law of "all-or-nothing" does not hold in the case of comb volume. The comb volume in the two individuals described remained intermediate in size.

The degree of development of head furnishings is dependent not upon the amount but on the state of the gonadic tissue. It appears to be related to the spermatogenic activity of the testicular fragment.

GREIG (Sir ROBERT) with SMITH (A. D. BUCHANAN). **Horns versus Polls.**

The advantages of the polled condition as compared with the horned are detailed and reference is made to several strains of polled animals occurring in breeds normally horned. How such strains have arisen or been made is explained.

McISAAC (P.). **Studies on Calcium Metabolism. I. Calcium Metabolism in the Pregnant and Lactating Rabbit.** *Brit. Journ. Exp. Biol.*, vol. v, No. 3.

Seven to ten days before parturition in the rabbit there is a fall in the serum-calcium content, and one day before parturition there is a further and sudden fall to a minimum.

After parturition the calcium content is restored to normality, but on the 19th day or thereabout of the lactation period there is a second sudden fall.

McISAAC (P.). **Studies on Calcium Metabolism. II. Calcium Metabolism in Relation to Sex in the Rabbit.** *Brit. Journ. Exp. Biol.*, vol. v, No. 3.

The blood serum content of 30 rabbits of both sexes was examined, the calcium being estimated by the Krumer-Tisdale method with slight modifications. The results show that in the rabbit the calcium values in the male are slightly higher than those in the female, always excepting the periods of pregnancy and lactation.

McISAAC (P.). **Studies on Calcium Metabolism. III. Comparison in Calcium Metabolism of Doe and Litter in the Rabbit.** *Brit. Journ. Exp. Biol.*, vol. v, No. 3.

The data are not numerous, but it may perhaps be concluded from them that the serum-calcium of the foetus is greater than that of the mother up to a few days before parturition, but that thereafter the foetal serum-calcium is less than that of the mother until the age of about a month is reached, when there is more or less equality.

NICHOLS (J. E.). **Corriedale Sheep in Great Britain.** *Journ. Min. Agric.*, June, 1927, vol. xxxiv, No. 3.

The history is given of a small flock of Corriedale sheep imported from New Zealand in 1924 and thereafter maintained in Fife. The results of crossing between them and various other breeds are also described.

NICHOLS (J. E.). **Some Observations on the Problems of Fertility and Fecundity in Sheep.** *Zeit. f. Tierz.*, B. X, Heft. f 2.

Data were obtained from flock records and the cases considered under the heads of Genetics, Age of Dam, Time of Service, Nutrition, Environment and Lethal Factors. All these seem to have some effect on both fertility and fecundity.

NICHOLS (J. E.). **On the Occurrence of Dark Fibres in the Suffolk Fleece, with Particular Reference to the Birth Coat of the Lamb.** *Journ. Text. Inst.*, Sept., 1927, vol. xviii.

The distribution of pigment in the fibre and pigmented areas in the fleece are discussed and data on colour changes obtained. Sheep were graded according to the amount of dark fibres present in the lower thigh. A provisional hypothesis concerning the mode of pigment deposition is suggested on lines comparable with those of the "reaction of Schultz." Thresholds of irritation for factors inhibitive of pigment production and a time relationship in development are, however, postulated.

ROBERTS (J. A. FRASER). **Colour Inheritance in Sheep. III. Face and Leg Colour.** *Journ. Genet.*, vol. xix, No. 2.

Variations in face colour fall into three groups :—

(1) Those affecting the relative proportions and distributions of coloured and white fibres.

(2) Those affecting the dilution of this pigment.

(3) Those affecting the precise degree of restriction of pigmentation in the white-faced sheep; this pigment being mainly confined to the skin.

Analysis of results of crosses of Suffolk and Dorset Horn sheep shows that they can be explained on the basis of a two-factor difference, variations being of group (1). It is suggested that this classification affords an explanation of variations in face colour found in white-fleeced breeds.

SMITH (A. D. BUCHANAN). **The Inheritance of Horns in Cattle. Some Further Data.** *Journ. Genet.*, vol. xviii, No. 3.

It is suggested that in certain crosses certain factors modify the normal mode of inheritance of horns. These complications appear to arise when blood strains other than those of the commoner domesticated breeds appear.

SMITH (A. D. BUCHANAN). **A Case of Superfoetation in the Pig.** *Journ. Anat.*, vol. lxi, pt. 3.

Previous reports of superfoetation in other animals are discussed, and also one other case in the pig. It is shown that the hypothesis of Kuntz is not applicable to the pig cases. Whether the case referred to—that of a Large Black Sow—is one of superfecundation or superfoetation is discussed, the writer being of opinion that the latter is the more likely.

SMITH (A. D. BUCHANAN). **Superfoetation. Further Cases in Pigs and Sheep.** *Journ. Anat.*, vol. lxii, pt. 1.

Three cases of alleged superfoetation in the pig and three in the sheep are discussed, that of a Border Leicester-Cheviot cross proving the most convincing case, as the possibility of its being due to superfecundation is ruled out.

SMITH (A. D. BUCHANAN). **Dual-Purpose Cattle.** *Scott. Journ. Agric.*, vol. xix, No. 2.

Arguments in favour of keeping a herd which at once provides good milkers and good beefing animals are adduced. It is shown that there are two ways of doing this, that most favoured being the establishment of a dual-purpose herd. This, it is suggested, is not only possible but has already been done.

TAMURA (Y.). **The Effects of Implantation upon Ovarian Grafts in the Male Mouse.** *Proc. Roy. Soc. Edin.*, vol. xlvii, pt. 2, No. 11.

Ovaries from litter sisters were grafted on the kidney of male mice. It was found that the grafts retained their ovarian structure, and it is suggested that the survival is dependent on vascularisation and on the activity of germinal epithelium. The original large follicles degenerate after transplantation, the smaller ones continue to develop for a time, but later degenerate. It is concluded that the presence of testes does not affect the vitality of the ovarian graft.

ROTHAMSTED EXPERIMENTAL STATION.

FISHER (R. A.). **Triplet Children in Great Britain and Ireland.** *Proc. Roy. Soc., B*, 1927, vol. cii, pp. 286-311.

Measurements taken at a fixed age of 115 surviving triplet children are reported upon in respect of the average growth attained, which is not appreciably different from that of children by single births; of the degree of resemblance between pairs of like and unlike sex, which confirm in entirely independent material the conclusions drawn from Lauterbach's measurements of twins; and of the inheritance of the twinning tendency, which in opposition to the view developed by Weinberg, indicates inheritance of diembryony on the paternal side.

(9) DAIRYING.

ANIMAL NUTRITION INSTITUTE, CAMBRIDGE.

SANDERS (H. G.). **The Variations in Milk Yields caused by Season of the Year, Service, Age and Dry Period, and their Elimination. Part II. Service.** *Journ. Agric. Sci.*, Oct., 1927, vol. xvii, pt. 4.

Curves showing the effect of the length of the service period on lactation yields are presented, and corrections worked out to standardise records in this respect; as a standard a service period of 85 days is taken, this being approximately the average length, and one which gives an interval between calvings of exactly one year. The effect of pregnancy on the yield throughout the lactation is also considered; the yield falls very slightly immediately after service, and this difference remains about constant until the 20th week, at which point a sharp drop occurs, the cow, on the average, being dry by the 32nd week of pregnancy.

SANDERS (H. G.). **The Variations in Milk Yields caused by Season of the Year, Service, Age and Dry Period, and their Elimination. Part III. Age.** *Journ. Agric. Sci.*, Jan., 1928, vol. xviii, pt. 1.

The effect of age on lactation yield is determined by considering the yields of particular cows in successive lactations; the production increases by 30 per cent. from the 1st to the 6th lactation, and then decreases, the curve representing the effect being practically symmetrical about the 6th lactation; low yielders increase by rather a greater proportion from their 1st calving to maturity. The increase is found to occur entirely in the early part of the milking period, the maximum yield rising more than the total yield, and the persistency of production declining.

SANDERS (H. G.). **The Variations in Milk Yields caused by Season of the Year, Service, Age and Dry Period, and their Elimination. Part IV. Dry Period and Standardisation of Yields.** *Journ. Agric. Sci.*, Apr., 1928, vol. xviii, pt. 2.

The length of the dry period has a large effect on yield, the production following a dry period of less than 10 days being 14 per cent. less, and that after one of 120 days 10 per cent. more, than that after a standard dry period of 40 days; if 2nd calvers be taken separately the corresponding figures are 25 per cent. and 12 per cent., which may be due to growth operating as an additional factor in their case; a long dry period appears to increase yield in the same proportion all through the next milking period. The standardising corrections obtained for the four factors studied are discussed and their efficacy tested.

SANDERS (H. G.). **The Standardisation of a Lactation Record.** Paper read at the *World's Dairy Cong.*, London, June, 1928.

The desirability of standardising milk records is urged, and tables of correction presented; whilst farmers should correct for Month of Calving, Service Period, Age and Dry Period, in order to obtain a proper appreciation of the relative merits of their cows, breed societies, etc., would be well advised to standardise for Service Period and Age only; a column giving yields standardised for these two factors would add immeasurably to the value of all published lists of records.

NATIONAL INSTITUTE FOR RESEARCH IN DAIRYING.

DAVIES (W. L.). **The Acid Values of Fats and Oils. A new Method for Determining the Barium Values of Fats and Oils.** *Journ. Soc. Chem. Ind.*, vol. xlvii, pt. 4, p. 24 T).

In determining the acid value of fats and oils, it is suggested that alkaline-earth bases should be used as titrating liquids into an alcoholic suspension of the fat or oil. Titration with any alkali into an aqueous layer containing an alkaline earth salt underneath an ethereal layer of the fat gives good results for both colourless and coloured fats.

A new method for determining the insoluble barium value of fats consists of ascertaining by titration the amount of barium chloride necessary to overcome the alkaline hydrolysis of soap in aqueous solution. Results for a number of fats are given, together with data concerned with inferences from the collected data.

The conditions of titrating the free alkali when determining the saponification number of a fat are investigated.

DAVIES (W. L.). **Tests for the Incipient Rancidity of Fats.** *Journ. Soc. Chem. Ind.*, June 29, 1928, vol. xlvii, pt. 26.

A survey of the more important tests for following the course of auto-catalytic oxidation of fats has been given. The Kreis test is not an indication of the degree of rancidity, but of the amount of three-membered carbon chain compounds capable of coupling together two molecules of phloroglucinol to form a flavonium salt.

A test which can forecast the keeping qualities of a fat is described. A sample of fat together with 1 c.c. of 0.25 per cent. methylene blue, is emulsified in 10 c.c. of diluted separated milk, and the blue colour allowed to be bleached by the "reductase" of the milk by incubating at 37-40°. After bleaching, the contents of the tube are well shaken and the depth of blue colour generated is noted. Carrying out the test on a large number of fats of known history and keeping properties, the depth of blue formed corresponded accurately with the ease of oxidation of the fats. The test was useful in detecting metallic contamination of fats, and was used in comparing the catalytic action of copper and iron in the oxidation of butter fat. Further, as a test for the state of oxidation of individual fats, this method was found more suitable than the Kreis test and less cumbersome than determining the "oxidisability" values of the steam-volatile and water-soluble constituents.

GOLDING (J.). **A Criticism of the New Hoyberg Method for the Estimation of Fat in Milk and Cream.** *Journ. of the B.D.F.A.*, 1928, vol. xl.

The new Hoyberg method is capable of giving sufficiently accurate results to make it comparable with methods in which a centrifuge is used.

The fact that the fat is inflated with substances other than fat makes it less reliable by the introduction of a new possible source of error.

The use of a proprietary alkaline liquid makes the method dependent on the makers for further supplies, whereas sulphuric acid can be readily obtained and different consignments do not prejudice the results when the gravity is adjusted.

On the other hand, the liquid is much safer to use, and removes a possible source of danger in the hands of young people or those unskilled in the use of chemical reagents.

The time taken is longer than with centrifugal methods, particularly if a large number of tests have to be made. The apparatus is simple and

seems to the writer to have special value for educational use and for use by farmers and others in the home or office.

The writer is of opinion that it could not be recommended to replace the Gerber test for milk recording or experimental work.

GOLDING (J.) & ZILVA (S. S.). The Influence of the Cow's Diet on the Fat Soluble Vitamins of Winter Milk. II. *Biochem. Journ.*, 1928, vol. xxii, pt. 1.

A winter ration for cows containing silage and hay is described, which produced an antirachitic butter of moderate potency. The daily addition of 2 oz. of cod liver oil to this ration did not significantly depress the percentage of milk fat nor did it raise the Vitamin D of the butter to any appreciable extent. Higher doses of cod liver oil depressed the percentage of milk fat and raised the antirachitic potency of the butter.

GOLDING (J.). Some of the Effects produced on the Richness of Cow's Milk by Feeding Cod Liver Oil. Paper read at the *World's Dairy Cong.*, July, 1928.

The elusive and variable quality of richness associated with milk fat can be experimentally controlled at will in three directions by feeding cod liver oil to cows:—

(1) Its physiological property of growth promotion associated with Vitamin A can be increased tenfold as compared with a basal ration of straw, mangolds and selected concentrates.

(2) Its antirachitic properties associated with Vitamin D can also be increased to a marked degree as compared with a similar control ration.

(3) The percentage content of fat in the milk can be reduced by feeding more than four to six ounces of cod liver oil per cow per day.

MACKINTOSH (J.). Dairy Cattle. *Black's Vet. Dict.*, 1928, pp. 200–216.

This article describes the various dairy breeds in Great Britain, the systems of management adopted under varying conditions, methods of rearing and feeding calves, followed by a note on the importance of good bulls in dairy herds.

MACKINTOSH (J.). The Feeding of Dairy Cows. Paper read at the *World's Dairy Cong.*, July, 1928.

This paper describes briefly the varied conditions under which dairy farming is carried on in Great Britain. The geological structure of the country gives rise to many different types of soil, and, therefore, a great variety of farm crops can be grown for the feeding of the dairy herd. Home grown foods can also be supplemented by a wide range of concentrates. Under such diverse conditions a clear understanding of the general principles governing the selection of rations for dairy cows is necessary.

The feeding standard for milk production commonly adopted is given, and some of the difficulties which arise in the application of this standard are discussed.

The need for additional information on the composition of farm foods grown in different districts is emphasised. Also other important points in the selection of rations in addition to compliance with a feeding standard are considered, for example, bulk, effect on the digestive system and the mineral content of the ration.

A brief description is also given of the best practice in the feeding of cows under winter and summer conditions.

MATTICK (A. T. R.) & PROCTER (F.). **The Production of Milk of Low Bacterial Count by means of Milking Machines.** *Journ. Hyg.*, Jan., 1928, vol. 27, pt. 2.

The machine used was an Alfa-Laval, and two milking units were used during the experiment, the one washed and the other sterilised by steam. The irregularity of the bacterial counts obtained led to the investigation of the vacuum pipe line and it was found that contamination was taking place through the entry of water from the pipe line into the receiving pail. This was avoided by the provision of traps in the pipe line, and a slope of not less than 3 in. in 15 ft. to all parts of the pipe line, drain cocks being provided at the end of each sloping section, and the drying out of moisture by the drawing of air through before and after milking. Subsequent bacterial counts for both units were very satisfactory, but a comparison of the summer counts from the two units shows that the sterile unit was the more satisfactory, which was also the case when a comparison was made of the keeping qualities of the milk.

It was shown that the milking units and their rubber components may be successfully sterilised by steam without seriously shortening the life of the rubber parts.

MATTICK (E. C. V.). **The Chemical Composition of the Milk of Cows Receiving Cod Liver Oil.** *Biochem. Journ.*, 1928, vol. xxii, pt. 1.

The analyses of the milk of cows which have been fed on well-balanced diets to which varying quantities of cod liver oil and arachis (pea nut) oil have been added, indicate that the addition of the cod liver oil results in changes in the chemical composition of the milk, particularly an increase in the percentage of total calcium.

Insufficient results have as yet been obtained to justify any very definite conclusions, but in view of the fact that the butter made from the milk of cows fed on cod liver oil is known to be much more strongly antirachitic than butter from the milk of cows which have not received cod liver oil, the results already obtained seem to be of sufficient interest to warrant further analyses.

MEANWELL (L. J.). **Pasteurisation and the Tubercle Bacillus.** *Dairyman*, July, 1928.

A short review of the work done on this subject by Delépine from 1899 onwards and recent investigations by various workers, including the author, emphasising the conclusions already drawn in his paper in the "Journal of Hygiene," xxiv, pt. 4, Oct., 1927.

MEANWELL (L. J.). **An Investigation into the Effect of Pasteurisation on the Fovine Tubercle Bacillus in Naturally Infected Tuberculous Milk.** *Journ. Hyg.*, Oct., 1927, vol. xxiv, pt. 4.

Experiments have been made on the milk of three cows suffering from tuberculosis of the udder. The milk was heated at various temperatures between 138-8° F. and 145° F. for 20 to 50 minutes. The results of this work show that:—

(1) A temperature of 145° F. for 30 minutes does not invariably kill the tubercle bacilli in naturally infected milk, although in most cases this temperature is effective.

(2) At a temperature of 140° F. for 20 minutes, tubercle bacilli are in many cases destroyed, but this combination of time and temperature allows no margin of safety.

The experiments demonstrated that the accuracy of thermometers used to record the temperatures maintained during heating in commercial pasteurisa-

tion is of great importance. It was found that, whilst at 140° F. tubercle bacilli are usually destroyed, at 138·8° F. they survived in no less than ten out of twelve occasions, the exposure lasting 20 minutes in both cases.

SANTOKH SINGH. A Study of the Inheritance of Milking Capacity in Pedigree Shorthorns. *Journ. B.D.F.A.*, 1928, vol. xl.

The following is a summary of the author's conclusions :—Careful selection and grading appear to be the best policy to improve the milk producing capacity of a herd. The basis of selection should be the continual good performance on both the sire's and dam's side of the individual selected, provided, of course, that constitution is maintained and the good looks or breed characteristics are not lost sight of. Therefore, a bull selected to grade up the herd for milk production should be descended on both sides from healthy ancestors of high milk producing capacity and good breed type. But the final judgment on the merit of the bull should be delayed till the performance of his progeny is known. Similarly, a heifer selected for the herd should be descended from high producers of the desired type on both sides of the ancestry, in order to stand a good chance of getting progeny possessing high milk producing qualities.

SARGEANT (M.), DEARDEN (D. V.) & MATTICK (A. T. R.). The Keeping Quality of Cream without Preservative. *Milk Ind.*, June, 1928.

Experiments carried out on the keeping quality of cream without preservative tended to show that it is necessary to pasteurise cream from ordinary commercial milk in order to make its distribution at all possible, but raw cream from clean milk was found to have keeping qualities of sufficient length to meet the demands of some sections of the trade. Without the addition of preservatives the accumulation in cold storage of cream (particularly that separated in the warm months) to meet temporary large demands appears to be no longer feasible, since deterioration after a period of cold storage is rapid.

STENHOUSE, WILLIAMS (R.). The Milk Supply—What Shall Our Policy Be? *Journ. State Med.*, Feb., 1928, vol. xxxvi, pt. 2.

A consideration of the steps which are being taken in order to improve the milk supply has shown that an immense amount of work is being done, not only by those interested in agricultural education and public health, but also by those concerned more directly with the commercial side of the industry. The institution of clean milk competitions, and the creation of advisory bacteriological posts by the Ministry of Agriculture, the provision of classes for dairymen at the Chelsea Polytechnic and the introduction of the licensing system by the Ministry of Health, are great steps forward in the education of milk producers and in the improvement of the quality of milk. Within the dairy industry itself there is evidence of an increasing desire to make use of scientific knowledge and a recognition of the increased monetary value of a superior product. Tables of figures are given showing the improvement in the quality of milk, as judged by bacteriological counts, which has been effected in the supplies of various towns.

STENHOUSE WILLIAMS (R.). Education and Advisory Work amongst Milk Producers and the Handling of Milk at the Farm. *Paper read at the World's Dairy Cong.*, July, 1928.

These subjects are dealt with under three headings, namely, research, advisory work and teaching. Under the heading of research, the author describes very briefly the work of the National Institute for Research in

Dairying, and under the second heading the advisory work, originating at the Ministry of Agriculture and further carried out by the agricultural organisers and their staffs. Under the third heading are mentioned the various Degree and Diploma courses which may be taken at the Universities, Agricultural Colleges and Farm Schools, the growth of the licensing system of graded milk in England and Wales and the growth of clean milk competitions.

WRIGHT (N. C.). **The Mechanism of the Secretion of Calcium and Phosphorus in Milk.** *Journ. Agric. Sci.*, July, 1928, vol. xviii, pt. 3.

The formation of colloidal calcium phosphate by the interaction of calcium chloride and sodium phosphate in the presence of neutral caseinates has been demonstrated. The colloidal calcium phosphate is shown to be non-diffusible across a membrane of cellophane.

There appear to be at least two general mechanisms which may cause the accumulation of high concentrations of calcium and phosphorus in milk, namely, the action of casein in forming a slightly dissociated calcium caseinate and the supersaturation of this caseinate solution with calcium phosphate, leading to the formation of a colloidal and non-diffusible solution of this salt which is consequently trapped in the milk cells.

ROWETT RESEARCH INSTITUTE.

MAGEE (H. E.) & GLENNIE (A. E.). **Studies on the Effect of Heat on Milk. IV. The Iodine Content.** *Biochem. Journ.*, 1928, vol. xxii, No. 1.

Heat caused the disappearance by volatilisation of 20 per cent. or more, according to the duration of heating, of the total iodine of separated milk. The ratio of diffusible to non-diffusible iodine was the same in the milk after heating as it was before. Approximately 83 per cent. of the total iodine of separated cow's and goat's milk was found to be in diffusible form.

UNIVERSITY OF LEEDS.

CHALMERS (C. H.). **A Study of Coliform Organisms in Samples of "Certified" Milk.** *Journ. Hyg.*, 1928, vol. xxvii, No. 3.

The experiments described in this paper show that of the 268 coliform organisms isolated from 32 samples of "certified" milk, 65.7 per cent. fell within the true *B. coli* group and 18.6 per cent. in groups X and Y of Stewart.

Fifty-four per cent. of the organisms isolated were assumed to be of faecal origin and 46 per cent. of the type generally found in soil and water.

Although the majority of the coliform organisms present in milk ferment lactose it was found that other members of the coliform group occur which are not lactose fermenters, and consequently their presence is not demonstrated by the presumptive test for *B. coli*.

CHALMERS (C. H.). **A Modification of the Alcohol test as an Index of the bacterial count and Keeping Quality of Milk.** *Journ. Bact.*, 1928. Vol. xv, No. 2.

Experimental work was carried out on the use of the alcohol test and the following modification is suggested:—A preliminary incubation of the milk for 9 hours at 37° C; the use of 83 per cent. (by volume) neutral alcohol containing 0.02 per cent. methyl red instead of 70 per cent. alcohol alone. The test so modified gives an index of the "life" of a sample of milk and consequently of its commercial value.

HARPER ADAMS AGRICULTURAL COLLEGE.

CROSSLEY (E. L.). **Report of the West Midland Advisory Department,** May, 1928, pt. 5.

A general summary of the work of the bacteriologist during the year is given.

The outstanding results of the Clean Milk Competitions held in the advisory area are noted.

Information concerning the various factors which influence the keeping quality of milk is given, and the importance of these discussed and summarised.

The conditions of occurrence and the characteristics of milk from inflamed udders are described, together with their effect upon the bulk supply. A procedure for the detection of unsuspected abnormal udders is recommended.

A brief summary is given of the research in progress at the centre on the discoloration of cheeses by pink yeasts, with tentative conclusions. Some cheese defects and taints in milk caused by coliform organisms investigated during the year are also noted.

CROSSLEY (E. L.). **Report on the Warwickshire Clean Milk Competition, 1928.**

The high total bacterial count figures of the previous year were considerably reduced, due to the improved cooling and increased facilities for the washing and steaming of utensils.

Some of the high counts are attributed to cases of unsuspected udder trouble. Slight improvements are also noted as regards the prevalence of coliform bacteria, whilst the keeping qualities show an improvement, well maintained during the hot weather. Fifty per cent. of the samples were of graded standard, considerable improvement having been effected amongst the "ordinary" producers. Attention is drawn to the fact that 17 per cent. of the samples contained less than 3.0 per cent. butter fat.

CROSSLEY (E. L.). **Report on the Shropshire Clean Milk Competition, 1928.**

76 per cent. of the samples submitted attained graded standard.

The chief feature noted is the high percentage of "Certified" samples, viz. 62 per cent., as compared with 44 per cent. in 1927.

Little change is observed from the 1927 results as regards the total numbers of bacteria (already low in 1927), but improvements are recorded in the incidence of coliform organisms, in longer keeping qualities, and in greater freedom of the milk from visible dirt. The high proportion of "Certified" samples is correlated with the reduced numbers of coliform bacteria.

MIDLAND AGRICULTURAL COLLEGE.

CRANFIELD (H. T.). **Variation in the Quality of Milk.** *Berks. Farmers' Yr. Bk.*, 1928.

This paper enumerates the various difficulties which confront the dairy farmer in his endeavour to keep the quality of his milk up to the standard required by the Sale of Milk Regulations. The need for further research into the causes of variation is emphasised, but in spite of the paucity of the information at present available, various methods by which variation can be partially controlled by the farmer are suggested.

The possibility in the future of the sale of milk on a quality basis is referred to, and the advantages of such a system are given.

CRANFIELD (H. T.). **The Influence of Feeding on the Composition of Milk.** *Derbyshire Farm.*, Mar., 1928, vol. viii, No. 3.

This short article deals with the effects of this important factor in milk production. Two effects of feeding are mentioned:—(a) increase in yield, and (b) increase in secretion of solids in milk. The temporary alteration in quality caused by the stimulative effect of certain rations is also referred to. The present state of knowledge on this question is summarised as follows:—(1) normal balanced rations containing ingredients of good wholesome quality will give the best results; (2) a change in composition of the ration at not too frequent intervals is desirable, but the change should be gradual; (3) good quality hay and pasture grass are essential for good milk production—quality not quantity should be the maxim in the management of meadows and pastures.

CRANFIELD (H. T.). **Natural Variation in the Composition of Milk, and the Difficulties encountered in distinguishing between Abnormal and Adulterated Milk.** *Proc. World's Dairy Cong. (London)*, 1928.

This paper opened the discussion on the newer methods for the detection of adulteration in milk, at the Chemical Technique Section of the World's Dairy Congress in London. The first part of this paper consists of a brief outline of the reasons necessitating presumptive limits of composition for the sale of milk. The second point dealt with concerns the extent of variation in composition which may occur in perfectly genuine milk, and the great difficulty which confronts the analyst in deciding whether low quality milks are genuine or not. Finally brief reference is made to the latest attempts to solve this problem, and the writer urges the importance of the discovery of some method which will distinguish, without a shadow of doubt, between genuine and adulterated milk.

SOUTH EASTERN AGRICULTURAL COLLEGE, WYE.

BARKWORTH (H.). **A New Pipette Used in the Bacteriological Testing of Milk.** *Journ. Hyg.*, July 15, 1927, vol. xxvi, No. 2.

The standing difficulty with the normal bulbed pipette is to clean the inside surfaces of the bulb. With a new pattern introduced by the writer the *whole* of the inside surface can be reached for cleaning. Pipettes have been made to this design by Messrs Baird and Tatlock, Ltd. (London).

The especial points are:—(1) a long neck above the mark for use when mixing dilutions; (2) long sloping shoulders to both ends of the bulb; (3) no neck below the bulb.

As originally ordered these pipettes were made to *contain* ten cubic centimetres, being intended for blow-out purposes.

UNIVERSITY COLLEGE OF NORTH WALES, BANGOR.

ROBERTS (E. JONES). **Comparison of Dairy Shorthorn and Welsh Black Cattle as Milk Producers, and Effect of Time of Calving on the Yield of Milk.** *Journ. Agric. Sci.*, July, 1926.

These breeds have been kept together and daily milk records kept on the College Farm, Aber, since 1912. While there was no significant difference in the mean yields, the form of the lactation curve differed considerably for the two breeds. The Shorthorn curve is steeper—the yield is higher for the first few weeks after calving, but falls off more rapidly than that of the Welsh. Cows calving in March, April and May gave a considerably higher yield than those calving in June, July and August.

ROBERTS (E. JONES). **A Comparison of Welsh and Shorthorn Cattle as Milk Producers.** *Welsh Journ. Agric.*, 1927, vol. iii.

The breeds were compared as regards the extent to which they responded to the effects of spring grass. The Welsh gave an average increase of 3.7 lbs. of milk per day for the first week after turning out to grass (1913-1926) and the Shorthorns 3.1 lbs. per day ; the difference is not significant.

ROBERTS (E. JONES). **Comparison of Milk Yields given by Heifers with those given by the same Animals at Later Periods.** *World's Dairy Cong.*, 1928. (Paper read at Physiological Section.)

Putting the first lactation yield of 41 Welsh Black Cattle at 100, the average yields in the first five lactations of these cattle are 100, 107, 121, 121 and 129. These figures take no account of cows weeded out of herds before their sixth calf. After making allowance for such selection the comparative yields are 100, 102, 111, 114 and 122. Evidence is brought forward which suggests that a heavy yield of milk in one lactation adversely affects the yield in the next.

UNIVERSITY COLLEGE OF WALES, ABERYSTWYTH.

THOMAS (S. B.). **A Study of Some of the Factors Governing Clean Milk Production.** *Welsh Journ. Agric.*, 1927, vol. iii.

A summary of the bacteriological results of the clean milk competitions organised in Brecon and Radnor, Carmarthen, Montgomery and Pembroke during 1926 is given. The results prove that milk of a very high standard of cleanliness can be produced under normal conditions existing on the majority of Welsh farms, providing cleanliness is ensured in the byre and dairy.

The four chief factors in the production of clean milk are as follows : (a) sterilization of utensils by steam or scalding water ; (b) attention to details during milking ; (c) cooling to as low a temperature as possible, *immediately* after milking ; (d) the personal factor.

THOMAS (S. B.) & LEWIS (J.). **Studies on the Bacteriological Content and Keeping Quality of Milk.** *Welsh Journ. Agric.*, 1928, vol. iv, pp. 147-157.

Statistics concerning the results of the bacteriological examination of 908 milk samples taken from 141 farms in Mid and West Wales are given. A general summary is given of the conditions under which the milk is produced. When a sufficient number of samples are taken it is seen that (a) there is a general fall in the keeping quality as the bacterial count increases ; (b) the presence of coliform organisms has a deleterious effect on the keeping quality ; (c) an increase of 10°F. in transit temperature (53 F. to 60 F.) decreases the keeping quality by one day.

A special study is made of the personal factor as applied to the production of milk with a low count on small farms. The buildings and equipment are generally poor on these small farms, but personal efficiency and care in the methods of production, due to family labour, counteract this deficiency.

THOMAS (S. B.). **Bacteriological Report on the Pembrokeshire Butter Competition, 1928.** *Pembroke. Agric. Ctee. Rep. on the C. M. Comp. and Butter Comp.*, 1928, pp. 20-22.

The butter competition held in Pembrokeshire during January to June, 1928, was the first of its kind to be held in the country. A bacteriological

and chemical report on two samples of milk from each of the fifteen competitors is given. The importance of the elimination of coliform organisms in order to produce first grade butter is emphasised. The types and numbers of moulds and yeasts present in 18 butter samples examined are given.

THE WEST OF SCOTLAND AGRICULTURAL COLLEGE.

MCCANDLISH (AND. C.). **Roots or No Roots ?** *Scott. Farm.*, 5th Nov., 1927.

This is a report of a trial in which an allowance of 40 lbs. of swedes and 12 lbs. of hay was compared with a roughage allowance of 20 lbs. of hay in the feeding of dairy cows. The milk and butter-fat production were slightly higher when the roots were fed than when no succulent feed was included in the ration. The roots had a feeding value of 18s. per ton, and their inclusion in the ration reduced the feed cost of milk production by $\frac{1}{4}$ d. per gallon.

MCCANDLISH (A. C.). **Individual Feeding of Dairy Cows.** *Scott. Farm.* 3rd Dec., 1927.

A discussion of the principles underlying individual feeding is given and simple methods of accurately apportioning the concentrates to a herd are outlined. A convenient feed barrow fitted with scales is described.

MCCANDLISH (A. C.). **Palatability Pays.** *Scott. Farm.*, 14th Apr., 1928.

Palatability in the ration is an important factor in the feeding of dairy cows. The nature, condition and preparation of the feed are among the factors influencing the palatability of the ration. Variety in the feeds given is closely linked with palatability.

Cows show great variation in their taste and these must be catered for if high production is desired. Cows prefer ground to whole grains but figures are presented showing that calves prefer whole to ground grains and thrive better on them.

MCCANDLISH (A. C.). **Is there any Relationship between the Age of the Heifer at First Calving and her Ultimate Production?** *World's Dairy Cong.*, June, 1928.

Records are presented for 682 Ayrshire cows with a total of 4154 completed lactations. The ages at first calving varied from 19 to 41 months. It was found that the best age at which to calve Ayrshire heifers for the first time was around $2\frac{1}{2}$ years. Nothing was to be gained, so far as ultimate production was concerned by delaying the date of first calving beyond this ; in fact there was a small but consistent decrease as the heifers advanced from $2\frac{1}{2}$ to 3 years of age at the time of first calving.

MCCANDLISH (A. C.). **Feed the Cow a Bulky Ration.** *Scott. Farm.*, 18th & 25th Aug., and 1st & 8th Sept.

A distinction is made between "bulk" and "bulkiness." A review is presented of trials conducted at various centres which show that a bulky ration is desirable in the feeding of dairy cows. Suitable rations are given.

MCCANDLISH (A. C.). **The Place of Succulent Feeds in the Dairy Ration.** *Journ. Brit. Assoc. Advancement Sci.*, Sept., 1928, p. 95.

The relative values of roots, silage and dried beet pulp are discussed. Swedes were found to increase milk production slightly and to lower the

feed cost when an allowance of 40 lbs. was added to a ration containing no succulent feed.

Even 60 lbs. of swedes per cow daily is not too high an allowance, since, when compared with an allowance of 40 lbs. of swedes the extra 20 lbs. were worth £1 per ton.

It was found that on the average $11\frac{3}{4}$ cwt. of silage, or $3\frac{3}{4}$ cwt. of dried beet pulp was equivalent to one ton of swedes. Swedes, silage and dried beet pulp give good results for milk production, and the choice of succulent feed will depend on cost.

McCANDLISH (A. C.). **Bean Meal for Dairy Cows.** *West Scot. Agric. Coll. Bull.* 112., Sept., 1928.

This is a report on five trials in which meals from China, White Rangoon, and Sicilian beans were compared with meal from home-grown beans. All were found to be of about equal value for the purposes of milk production. The literature on the subject is reviewed.

McCANDLISH (A. C.). **Rearing Dairy Calves.** *West Scot. Agric. Coll. Bull.* 113, Sept., 1928.

A general review of the problems connected with the rearing of dairy calves is given. The results of a number of feeding trials, chiefly with the self-feeder, are included. The feeding of calves is discussed in detail, while considerable attention is also given to management.

(10) ANIMAL DISEASES.

INSTITUTE OF ANIMAL PATHOLOGY, CAMBRIDGE.

BUXTON (J. B.) & SALISBURY (McN. A.). **The Intradermal Tuberculin Test in Cattle. Collected Results of Experience.** *Med. Res. Counc. Spec. Rep.*, Series No. 122.

The authors were appointed in 1927 to collect the views and experience of those veterinary surgeons who were known to be using the test in various parts of Great Britain.

The report consists mainly of the critical analysis of the replies—77 in number—to a questionnaire sent out by the authors.

The general conclusion is that the vast majority of veterinary surgeons who have experience of the double intradermal test regard it as much more trustworthy in its results, and much easier to conduct, than the subcutaneous test. They find that the test can be readily performed under farm conditions, that its technique is easily acquired, that it has little or no effect upon milk yield, and that it may be applied without risk to pregnant cows and young animals.

The report concludes with a detailed account of the method of carrying out the double intradermal test, and an appendix on the potency of tuberculin.

CORNELL (R. L.). **A Note on Infectious Necrosis of Canary Birds.** *Vet. Journ.*, July, 1928.

A description is given of an outbreak of a specific disease which causes considerable losses in the aviaries of canary breeders in this country. The principal lesions are found in the liver and kidney, in the form of multiple necrotic areas. The causal organism is readily recovered from the lesions and from the heart's blood. The disease is spread by the droppings of infected birds. The organism when injected into mice and guinea pigs sets up a fatal condition. The disease can be reproduced in sparrows by adding a culture to their drinking water.

GLOVER (R. E.). **Contagious Pustular Dermatitis of the Sheep.** *In the Press.*

Certain outbreaks of this condition, which is characterised by the formation of papillomatous-like excrescences on the lips of lambs, are caused by a filterable virus. This virus, which is highly resistant to desiccation, exists in great abundance in the dried crusts from the lesions. Inoculated on the scarified thigh, it produces an eruption which bears a close resemblance to the lesions of vaccinia. It has been possible to render susceptible animals immune to the disease by the inoculation of a glycerinised emulsion of desiccated material.

LEIGHTON (G.) & BUXTON (J. B.). **The Distribution of *Bacillus Botulinus* in Scottish Soils.** *Journ. Hyg.*, Aug., 1928, vol. xxviii, No. 1.

A report of the results of the examination of one hundred samples of soil taken from different Scottish counties with a view to determining the presence of *Bacillus Botulinus*.

The series yielded only 4 per cent. of positive results as compared with 5.5 per cent. in Denmark ; 7.8 per cent. in England, 20 per cent. in Holland, and 23.5 per cent. in Switzerland. It would not be safe, however, to conclude that the organism is relatively and proportionately rare in Scotland.

It is definitely shown for the first time that both the A and B types of *Bacillus Botulinus* occur in Scottish soils.

Only eight samples of soil gave filtrates containing tetanus toxin. Four of these came from matured cultivated land, one from old pasture, and one from moorland.

TURNER (A. W.). **Note on Infectious Necrotic Hepatitis of Australian Sheep. (Black Disease, Braxy.) (Sur la Pathogenie de l'Hepatitis infectieuse necrosante (Black Disease, Braxy) du Mouton.** Turner (A. W.), *Comp. Rend. Soc. de Biol.*, Feb. 24, 1928, T.xcviii, No. 7, p. 513.)

The necrotic areas which are observed in the livers of sheep affected with Braxy have never been reproduced in experimental animals by the inoculation of *B. Oedematiens*. In this paper it is shown for the first time that the intrahepatic inoculation of a spore suspension of *B. Oedematiens* deprived of their toxin by heat, together with a solution of calcium nitrate, results in a fatal infection in rabbits, with the production of lesions in the liver, indistinguishable from those occurring in the sheep.

It is suggested that sheep become infected through the agency of flukes, which provoke areas of necrosis in the liver and thus pave the way for the action of *B. Oedematiens*.

TURNER (A. W.). **The Fate of the Spores of *B. Oedematiens* injected by the Pulmonary or Intravenous Routes. (Le Sort des Spores de *B. Oedematiens* injectees par voie pulmonaire ou intraveineuse.** Turner (A. W.), *Comp. Rend. Soc. de Biol.*, March 2, 1928, T.xcviii, No. 8, p. 558.)

Rabbits are unaffected by the intratracheal or intravenous inoculation of "detoxicated spores" of *B. Oedematiens*. After intratracheal introduction, the spores can be demonstrated in the lung tissues both by staining and cultural methods, up to seven days. They then disappear from the lungs, and can then be found in the spleen, liver, bone marrow, etc. Similarly, following intravenous inoculation, the spores can be detected in the internal organs up to the 19th day.

It is suggested that under natural conditions sheep inhale the spores of *B. Oedematiens*, which then travel by way of the trachea into the lymphatic system, and thence to the various internal organs, including the liver. The disease then arises from the germination of these latent spores.

ANIMAL BREEDING RESEARCH DEPARTMENT, UNIVERSITY OF EDINBURGH.

CREW (F. A. E.). **On Natural Immunity.** *Vet. Rec.*, June, 1927.

An address to a joint meeting of the Lancashire Division and the North-Western Branch of the Society of Medical Officers of Health, held at Manchester on June 16th, 1927.

INSTITUTE OF AGRICULTURAL PARASITOLOGY, LONDON SCHOOL OF HYGIENE AND TROPICAL MEDICINE.

CAMERON (T. W. M.). **On Some Parasites of the Rusty Tiger Cat (*Felis planiceps*).** *Journ. Helm.*, vol. vi, No. 2.

This is the description of a case of polyparasitism in a wild cat, in which thirteen different species, belonging to many diverse families of helminths, were recovered. Of these a trematode, a cestode and a nematode were found to be new to science and are described in detail.

CAMERON (T. W. M.). **On a Species of *Onchocerca* from the Ox in West Africa.** *Journ. Helm.*, vol. vi, No. 3.

This is the description of a species of nodular worm from Gold Coast cattle. Morphologically it is very closely related to, if not identical with, the human species in the same area. It forms a cyst, which superficially resembles that of *Cysticercus bovis*, the cystic stage of the common human *Taenia*.

CAMERON (T. W. M.). **On the Habitat of *Aelurostrongylus abstrusus*, the Lung Worm of the Cat.** *Journ. Helm.*, vol. vi, No. 3.

An examination of the pathological alterations of the lungs of cats infected with this parasite had suggested that the adult forms lived, not in the lung proper, but in the blood-vessels between the heart and the lungs. This was found to be the case. The adults lay their eggs in the blood-vessels and the eggs are carried to the smaller capillaries, where they develop. Larvae hatch from these and escape into the alveoli, pass up the trachea, are swallowed, and so reach the exterior. Their subsequent life-cycle in mice has already been described.

LEWIS (E. A.). **A Study of the Helminths of Dogs and Cats of Aberystwyth.** *Journ. Helm.*, vol. v, No. 4.

This is an annotated list of specimens collected from these animals by the writer, together with a description of some interesting malformations found in tapeworms. No trematodes were found, but only 11 out of 59 dogs, and 30 out of 155 cats were free from cestodes or nematodes. No new species are recorded.

LEWIS (E. A.). **Observations on the Morphology of *Syngamus* of some Wild and Domestic Birds.** *Journ. Helm.*, vol. vi, No. 2.

A comparative study of the morphology of specimens of gape-worms collected from chickens, turkeys, bantams, pheasants, starlings, rooks and blackbirds has convinced the writer that all, with the exception of specimens from blackbirds, are referable to the species *S. trachea*.

MORGAN (D. C.). ***Parastrongyloides winchessi* gen. et sp. nov. A Remarkable New Nematode Parasite of the Mole and the Shrew.** *Journ. Helm.*, vol. vi, No. 2.

The author records the finding of a new nematode from the mole and the shrew, and gives a detailed description of the parasite. The worm is closely related to members of the genus *Strongyloides*, which are differentiated into males and females in the free-living generation only. This parasite in the mole and the shrew, however, although morphologically similar to *Strongyloides* species, has both male and female in the *parasitic* generation.

TRIFFITT (M. J.). **Further Observations on the Development of *Globidium gilruthi*.** *Protozoology*, No. 4.

Early developmental stages of this parasite, which have been hitherto unobserved, are described and figured. The parasite is compared throughout its known life cycle with *Globidium mucosa* of the Wallaby. Observations on the position of the cysts at various stages of development within the mucosa of the host, and the final liberation of the spores into the lumen of the abomasum are described, and the possible significance of these as indicating the mode of transmission is discussed.

TRIFFITT (M. J.). **Further Observations on a Flagellate Parasitic in the Gut of *Diplogaster longicauda*.** *Protozoology*, No. 4.

The effects on the flagellate of the environment of the host, e.g., food substance, temperature and humidity, are described. The results of a series of transmission experiments are also given, together with an account of the course of the infection within the gut of the host, and observations on the morphology of the parasite throughout the course of an infection.

TRIFFITT (M. J.). **On a Nodule-forming Parasite from the Skin of a Newt.** *Protozoology*, No. 4.

Cyst-like bodies from the skin of a newt were sectioned and found to contain a spore-producing parasite, possibly of a fungoid nature. The development of the spores is traced and described, and figures of the developmental stages are given.

TRIFFITT (M. J.). **A New Species of *Eimeria* Parasitic in a Millepede.** *Protozoology*, No. 4.

The oocysts of a new species of *Eimeria* found in millepedes on the Institute's Field Station are described. Special interest attaches to the very local distribution of the parasite, which is the first species of this genus described from a millepede host. The name *Eimeria ekdysios* is suggested, the diagnostic characters are described and figures are given.

MINISTRY OF AGRICULTURE AND FISHERIES,
VETERINARY LABORATORY.

DOYLE (T. M.). **Fowl Pox.** *Journ. Min. Agric.*, Dec., 1928, vol. xxxv, No. 9, pp. 838-843.

This is a popular version of an investigation of fowl pox, a report of which appeared in the *Journ. Comp. Path. and Thera.*, vol. 40, 1927. It points out that most investigators agree that fowl pox and avian diphtheria are merely different manifestations of the same disease, and are due to a filter-passing virus.

The term "roup," which is often erroneously applied to fowl pox, should be restricted to the condition characterised by catarrhal inflammation of the eyes and nose when these are unaccompanied by lesions of fowl pox in any bird of the flock.

The article deals also with the lesions of the disease, mode of infection, "carriers," and most effective methods of control.

HOLTUM (A. W.). **A Double Intradermal Test for the Diagnosis of Bovine Contagious Abortion.** *Journ. Comp. Path. & Thera.*, vol. xli, pts. 1 & 2.

The author conducted a considerable series of tests with an antigen prepared by killing bacterial emulsions with heat. He claims to have shown the method to be superior to the ordinary agglutination test.

TAYLOR (E. L.). **The Genus *Moniezia* and the Proposed Reduction of its Species to Three.** *Proc. U.S. Nat. Mus.*, 1928, vol. lxxiv, No. 9, pp. 1-9.

Wide variation exists between individuals belonging to the genus *Moniezia*. Segments in the same worm also show great dissimilarity. Extremes of size and shape of various parts of different individuals are

found, on examination of many specimens, to be linked by a more or less continuous series of intermediates; and it is concluded that these characters are of no specific value. Three species only are validated:—*M. expansa*, *M. benedeni*, and *M. pallida*.

NATIONAL INSTITUTE FOR RESEARCH IN DAIRYING.

LITTLE (W. L.), SKENE KEITH (T.), & FAWNS (H. T.). **The Blood Sugar of the Cow in Milk Fever and under Normal Conditions.** *Vet. Journ.*, June, 1928, vol. lxxxiv, pt. 6.

Seventeen cases of milk fever were investigated by the authors, and the figures obtained support the view of other workers that there is no marked variation in the blood sugar, either above or below normal, in milk fever, and it is probable that the cause of the disease must be sought elsewhere. Samples of blood taken from normal cows showed variations within fairly wide limits, and this fact should be taken into consideration before the blood sugar of any isolated sample from a cow is stated to be above or below normal.

STENHOUSE WILLIAMS (R.) & HOY (W. A.). **Tubercle Bacilli in the Faeces of Apparently Healthy Cows.** *Journ. Hyg.*, Nov., 1927, vol. xxvii, pt. 1.

Samples of faeces were collected from apparently healthy cows in herds in various parts of England and Wales, and from them were selected those taken from fourteen farms on which the faeces of almost all the cows were examined. Five cows on four of these farms were found to be excreting tubercle bacilli. Complete tests were obtained in 391 cases, which yielded 6 positive results (1.53 per cent.).

STENHOUSE WILLIAMS (R.) & HOY (W. A.). **The Frequency of the Appearance of Tubercle Bacilli in the Faeces of Three Apparently Healthy Cows.** *Journ. Hyg.*, Aug., 1928, vol. xxviii, pt. 1.

Two hundred and thirty-two samples from three cows which were known to be excreting bacillus tuberculosis have been examined, of which 57 (24 per cent.) were positive.

One hundred and eighty-five samples were examined while these cows were still apparently healthy; of these 35 (18 per cent.) were positive.

ANIMAL DISEASES RESEARCH ASSOCIATION OF SCOTLAND.

POOL (W. A.), PRESTON (H.), & BROWNLEE (A.). **Studies in Lamb Dysentery.** *Journ. Comp. Path. & Thera.*, 1928, vol. xli, p. 173.

Search for pathogenic micro-organisms in the genital organs of ewes whose lambs had died from dysentery yielded negative results. In this work extensive bacteriological examination was checked by transmission experiments.

Transmission experiments demonstrated that the infective agent lies in the faeces of lambs affected with the disease and that infection occurs after birth by ingestion.

The whole study of the disease has indicated to the authors that there is no evidence of ante-natal infection and that the only natural route of infection is through the mouth.

ROWETT RESEARCH INSTITUTE.

McGOWAN (J. P.). **A Further Contribution to the Subject of Aplastic Anaemia.** *Proc. Roy. Soc. Med.*, 1928, vol. xxi.

From a consideration of one of the sequelae of iron deficiencies in pigs, new light is thrown on the method of formation of the cells of the blood: the usual interpretation of the results of a test for bile in the blood (Van den Bergh's test) is questioned: feeding with liver tissue as in Minot and Murphy's work on pernicious anaemia in human beings is found efficacious in the cure of this condition: while new light is thrown on the possible mode of causation of pernicious anaemia in human beings.

UNIVERSITY COLLEGE OF NORTH WALES, BANGOR.

JONES (T. H.) & MONTGOMERIE (R. F.). **A Note on the Treatment of Liver Rot of Cattle with Carbon Tetrachloride.** *Vet. Rec.*, Apr., 1928, vol. viii, pp. 269-272.

A record of observations made in the treatment of 127 young cattle affected with liver rot; the great majority being advanced cases. While no attempt was made to determine the minimum efficient dose, the writers believe that a single administration of 5 c.c. of pure carbon tetrachloride in capsule will clear all mature flukes from the liver of yearling cattle. Cattle rising two years old were efficiently treated by the administration of a dose varying from 7 c.c. to 10 c.c., but it appeared likely that this dose might even be reduced to 5 c.c.

In some cases a second or even a third dose was necessary, apparently because part of the infestation present when these cases were first encountered was of relatively recent origin.

MONTGOMERIE (R. F.). **The Control of Liver Rot by the Destruction of Adult Flukes.** *Hereford Breed Ann.*, 1928, vol. vi, pp. 20-22.

The manner in which dosage of whole flocks of sheep with a suitable anthelmintic may be used as a means to control liver rot is explained. Periodic dosage with 1 c.c. of pure carbon tetrachloride of all members of flocks which may have become infested is recommended.

MONTGOMERIE (R. F.). **Observations on Artificial Infestation of Sheep with *Fasciola Hepatica* and on a Phase in the Development of the Parasite.** *Journ. Helm.*, Sept., 1928, vol. vi, pp. 167-174.

The successful artificial infestation of 32 sheep with *Fasciola hepatica* is recorded.

On the 2,550 cercarial cysts administered to these sheep 954 were recovered as liver flukes on post-mortem examination—37.4 per cent. The percentage of the cysts which developed in individual sheep varied from 8 to 76. Six of forty-four control sheep were very slightly infested, two with five flukes, one with two and the other three with a single parasite.

The parasites recovered from each sheep were not uniform in size, and the stage of development reached varied much.

Ova of the liver fluke were first found in the faeces of the experimental sheep, in number sufficiently large to be estimated ten weeks after infestation, more commonly after eleven weeks and in some cases not even after fourteen weeks.

MONTGOMERIE (R. F.). Carbon Tetrachloride in Liver Rot of Sheep. The stage at which the Fluke is assailable by the drug and the bearing thereon of dosage. *Journ. Comp. Path. & Thera.*, Sept., 1928, vol. xli, pp. 191-198.

Observations made with artificially infested sheep showed that the assailable age of the liver fluke varied with the dose of carbon tetrachloride given. It became progressively less and less as the quantity of the drug was increased.

When the period since infestation was eight weeks or less dosage with 1 c.c. destroyed few, if any, of the parasites. After the lapse of nine weeks a number were destroyed and its administration ten or eleven weeks after infestation killed almost all the flukes.

When only four weeks had elapsed since infestation, dosage with 10 c.c. killed some of the parasites and almost all when the period since infestation was five, six, seven or eight weeks.

WALTON (C. L.) & WRIGHT (W. REES). Further Observations and Experiments on the Control of Liver Fluke. *Journ. Min. Agric.*, Nov., 1927, vol. xxxiv, No. 8, pp. 734-739.

This paper deals with the effects of solutions of copper sulphate on the ova masses of *Limnaea truncatula* (the small fresh water snail which acts as the intermediate host of the Liver Fluke), the results of desiccation of the eggs and of freezing, and also of freezing and desiccation on the snails. The results of observations and experiments are detailed. It was found that (1) egg-masses of *L. truncatula* are killed by very dilute solutions of copper sulphate; (2) Under laboratory conditions desiccation for more than twelve hours was fatal to egg-masses in all stages of development; (3) Under laboratory conditions freezing appeared to have no effect on egg-masses; (4) *L. truncatula* shows very considerable natural resistance to freezing and it is evident that frost cannot be relied upon as an aid to the clearance of ditches or pastures; (5) *L. truncatula*, although killed by direct desiccation, resisted drought longer than other species living with it, and under certain circumstances survived for considerable periods.

WALTON (C. L.) & WRIGHT (W. REES). Liver Rot and Its Control. *Journ. Bath & West & South. Count. Soc.*, 1927-28, vol. xi, ser. 6, pp. 43-60.

The disease due to *Fasciola hepatica*, the Liver Fluke, is discussed in the following order: historical; the Liver Fluke systematic position; general anatomy; life history; the host snail and its life history, and other species found with it; the control of *Limnaea truncatula* in the field, symptoms of Fluke Disease, treatment. References are given to 29 papers.

UNIVERSITY COLLEGE OF SOUTH WALES.

BISSET (N.). Observations on *Davainea proglottina* in the Domestic Fowl, with a Note on *Amoebotaenia sphenoides*, v. Linstow. *Vet. Journ.*, Jan, 1928.

The paper describes observations on the development of *D. proglottina* and discusses an outbreak of disease in fowls in which the parasites were closely associated with *Eimeria avium*. It was noted that the oncospheres in about 60 per cent. of cases emerged from the ova of their own accord, i.e., without the apparent necessity of solution of the oval envelope by the digestive juices of an intermediate host.

THOMPSON (H. W.). **Liver Fluke in Sheep.** *Advisory Leaflet, Univ. Coll., Cardiff.*

Gives a general account of the liver fluke and steps which it is possible to take to reduce the danger of infestation.

SOUTH EASTERN AGRICULTURAL COLLEGE, WYE.

THEOBALD (F. V.). **The Large Round Worm of the Fowl** (*Ascaridia galli*. Schrank). *Journ. S.E.A. Coll.*, No. 25, pp. 83-85.

This fowl parasite has occurred in considerable numbers in recent years. The paper deals with its life history and gives the correct name and synonymy. It is shown to be found also in ducks, pheasants, grouse, ptarmigan and the guinea fowl.

Reference is also made to the Allied Large Worm (*Ascaridia compar*. Schrank) and the Small White Worm (*Heterakis gallinae* of Gmelin), which are also intestinal parasites of poultry.

(11) AGRICULTURAL ENGINEERING.

INSTITUTE OF AGRICULTURAL ENGINEERING, OXFORD.

NEWMAN (J. E.). **Combine Harvesting.** *Journ. Min. Agric.*, July, 1928, vol. xxxv, No. 4, p. 337.

The machine is described and the question of its possible applicability to English conditions discussed. The main difficulty lies in the moisture content of the grain. With a combine cutting should be deferred until the grain is dead ripe, that is some ten days later than if a binder is used. Figures as to the moisture content of standing grain at Oxford are given, from which it appears that a crop will generally be dry enough to thrash on the field, but the grain will require artificial drying if it is to be stored. American experience seems to show that there is with the combine a saving of about one bushel per acre.

OWEN (B. J.). **Agricultural Engineering.** *Agricultural Research in 1926, London. R.A.S.E.*, 1927.

Gives a summary of the year's literature on agricultural engineering, including drainage. Recent German work on tractors is described. The progress of the application of electricity to agriculture in several countries is summarised. Under agricultural implements, stubble clearing machines, ploughs, artificial manure spreaders, drills, and potato and sugar beet harvesters are dealt with. There is a paragraph on the after treatment of crops and a bibliography of over 130 references to British, American, French, German and other literature.

OWEN (B. J.). **Recent Developments in Farm Implements.** *Field*, 5th July, 1928.

Progress in the development of agricultural machinery is necessarily slow ; advancement during the last generation has scarcely been so striking as that made a generation or so previously. As an instance of the difficulties caused by the manifold variety of conditions under which an implement may be called upon to work, reference is made to the mechanical harvesting of sugar beet and potatoes. The pros and cons for the use, in this country, of the combine harvester thrasher are briefly set out. A note on spacing drills is given. The question of increased speed of tractors is discussed, and the use of power, electrical and other, on the farm is alluded to.

(12) AGRICULTURAL ECONOMICS.

AGRICULTURAL ECONOMICS RESEARCH INSTITUTE, OXFORD.

Miscellaneous Papers in Agricultural Economics, 1926-27, vol. iv.

The Work of the Institute—The Teaching of Agriculture—Agricultural Economics in the Empire—The Transition of Agriculture—Chequered Experiences in Agriculture—Declining Prices in Agriculture—A Study of the Sugar-Beet Position—Some Aspects of the Sugar-Beet Question—Sugar-Beet in Oxfordshire—Sugar-Beet and Soil Fertility—Home-grown *v.* Imported Sugar—The State and Sugar-Beet—Sugar-Beet Costs and Returns for 1925-26—The Marketing of Livestock—Higher Farming—A Note on the Cost of Mole Draining—The Comparative Cost of Mangolds and Silage—The Economic Aspect of Grade A (T.T.) Milk Production—A Simple System of Farm Book-keeping.

BRIDGES (A.). **The Economics of Beet Growing.** *Univ. Bristol Sugar Beet Trials*, 1927, No. 2.

This paper embodies an address to a farmers' conference at Bristol University and deals with points of economic importance in the growing of sugar-beet and the utilisation of the by-products of the sugar-beet industry.

BRIDGES (A.) & LEE (J. R.). **Sugar-Beet Costs and Returns for the Year 1926-27.** *Agric. Econ. Res. Inst.*, pp. 27.

This report, which brings together the costs and returns of growing the sugar-beet crop in various parts of the country, is on lines similar to two previous reports for the years 1924-25 and 1925-26. The number of costs dealt with in this report is 270, drawn from 23 counties of England and representing 2,177 acres of sugar-beet. The details of the costs, the returns, and profits and losses are presented and discussed by soils and districts, and comparison is made with the results obtained in the years 1924-25 and 1925-26. The means of disposal of the leaves and crowns and the yields obtained are also given.

BRIDGES (A.) & LEE (J. R.). **Sugar-Beet Costs and Returns for the Year 1927-28.**

This is a preliminary statement giving the average costs and returns of growing sugar-beet in nine districts in England and Wales, and dealing with 443 costs covering 5,575 acres of beet. A table is given showing total average costs and returns for four soil types and for each of the nine districts. A second table presents a comparison of costs and returns for four years.

DAVIES (J. L.). **Grass Farming in the Welland Valley.** *Ox. Univ. Press*, pp. 66, with map, 3 graphs and 24 tables.

This study was undertaken in order to collect what information was possible about the systems of farm management on one of the best pasture areas in the country, to serve as a basis for any further specific investigation of the grazier's problems as a whole.

MAXTON (J. P.). **Agricultural Economics in the Empire.** *H.M.S.O.* pp. 24.

This report was prepared for the Agricultural Economics Committee of the Empire Marketing Board, to serve as a basis for discussion at the Imperial

Agricultural Research Conference in 1927. It deals with the study of agricultural economics in Empire countries and the relation of agricultural economists to public statistics. After outlining the special methods for studying the problems of farm management and the marketing of farm products, the report discusses the application of the results of agricultural economic research to the improvement of farming conditions.

ORWIN (C. S.). **Agricultural Economics.** *Agric. Res.* 1926, *R.A.S.E.*

A digest of the published work of the year in this subject for the use of farmers.

ORWIN (C. S.). **Declining Prices in Agriculture.** *Yorks. Post Trade Rev.*, Jan., 1928.

A review of farming in England during 1927.

ORWIN (C. S.). **The Agricultural Credits Bill.** *Banker*, June, 1927.

A criticism of the terms of the Agricultural Credits Bill, in which it is suggested that the provision for the supply of short-term credit is unlikely to be acceptable to farmers.

PREWETT (F. J.). **The Situation in England.** *Horace Plunkett Foundation. Yr. Bk. Agric. Co-op. Brit. Emp.*, 1928.

In this article the present situation of co-operative organisation in agriculture in England is discussed.

PREWETT (F. J.). **A Survey of Milk Marketing.** Based on conditions in Wiltshire and Somerset and the City of Bristol, June, 1927, *Ox. Univ. Press*, pp. 74, plus 24 maps and diagrams.

This publication shows the distribution of milk as between wholesalers for the liquid trade and manufacturers of milk products. The rise of road transport is illustrated and also the zoning of the area by the trade to secure the elimination of unnecessary transport. A detailed study is presented also of the retail distribution of milk in the City of Bristol, bringing out the overlapping and redundancy of services.

MINISTRY OF AGRICULTURE AND FISHERIES.

Pork and Bacon Trades in England and Wales. *Min. Agric. (Econ. Ser. No. 17).* Pub. H.M.S.O., price 6d. net.

The pork and bacon trades in this country have an aggregate annual turnover in the neighbourhood of over £100 million, imports being valued, in 1927, at £54½ million. This report on these trades may be regarded as completing a survey of the pig industry which was begun in the report already issued on the Marketing of Pigs (Economic Series No. 12). Like the latter report, it analyses the marketing processes and functions as they actually exist and suggests possible lines of improvement. The report shows clearly that producers, curers, wholesale and retail distributors and, indeed, all who are in any way concerned with the pig industry, have a common interest in its welfare and development and that the solution of the various problems which confront the various sections of the industry call for concerted action.

Separate treatment is accorded in the report to pork, bacon, hams, lard and offals, respectively.

Preparation of Fruit for Market. Part I. Apples, Pears, Plums and Strawberries. *Min. Agric. (Econ. Ser. No. 21).* Pub. H.M.S.O., price 6d. net.

The Report on Fruit Marketing (Economic Series No. 15) published by the Ministry dealt in a general way with the principles of fruit marketing as a whole and foreshadowed further reports dealing in detail with the best commercial practice in regard to the marketing of the various fruits grown in England and Wales.

The first of these further reports is now available, and deals with the preparation for market of apples, pears, plums and strawberries. The report has an introductory section which discusses points of general application in regard to varietal characters, thinning, picking, culling and grading, packing, packages, packing and pooling stations and cold-storage. This introductory section also includes a chapter explaining the scope of the Agricultural Produce (Grading and Marking) Act, 1928, and its application to the marketing of apples and pears.

The four remaining sections deal each with one of the four fruits covered by the report on the same lines as the introductory section but in greater wealth of detail. The report, which is profusely illustrated, is a practical handbook on the whole technique of preparing fruit for market.

Markets and Fairs in England and Wales. Part III. Northern Markets. *Min. Agric. (Econ. Ser. No. 19).* Pub. H.M.S.O., price 6d. net.

This report deals with the 496 markets and auction marts and 150 fairs located in Lancashire and Yorkshire and northwards to the Scottish border. Section I of the Report gives a general view of the markets as a whole, information being given regarding the markets for each class of commodity sold; a short summary of the position with regard to the rents, stallages and tolls is included. Section II reviews the markets of each county in relation to their agricultural environment, while Section III contains detailed descriptions of some of the more important markets. An important feature of the report is the Appendices, which give much useful information, including complete lists of markets and fairs in the area with information as to the market days, the market occupier, the area of the market, the commodities sold and the method of sale, etc. Although the report is mainly descriptive the descriptions are directed towards illustrating the adequacy or otherwise of the markets to perform their functions of assisting in the marketing and distribution of agricultural produce.

NATIONAL INSTITUTE FOR RESEARCH IN DAIRYING.

STENHOUSE WILLIAMS (R.). **Milk Prices.** *Essex F.U.Yr.Bk.*, 1928.

Evidence is brought forward to show that a great improvement can be effected in the quality of milk by a monetary interest and wise advice.

**CAMBRIDGE UNIVERSITY DEPARTMENT OF AGRICULTURE,
FARM ECONOMICS BRANCH.**

**An Economic and Financial Analysis of Seven Eastern Counties Farms
1926-27.** pp. 22, 5 tables.

Report No. 8 continues the sequence of annual reports on the economic and financial results achieved on typical East Anglian farms and deals with seven Lady Day entry holdings for the year 1926-27. The results on a total area of over 3,700 acres are analysed in detail and the salient *data* emerging from

the investigation are made available in five tabular statements covering respectively statistical, economic, crop costs, livestock returns, and the comparative over-all results for the previous years. Subsidiary tables in the text of the report give costs of milk production and tractor work.

Sugar Beet in the Eastern Counties, 1927, pp. 106, 8 diagrams, 34 tables, 8 appendices.

Report No. 9 gives the results of a comprehensive enquiry into the costs and returns of sugar beet production in the Eastern Counties in 1927. The results are based on the working of 100 farms covering 43,000 acres. The over-all cash cost and cash profit per acre in the year under review were £21 1s. 4d. and 5s. 5½d. respectively. Considerable space is given to statistical analyses of the principal factors influencing the results, e.g. dung, sub-soiling, rates and dates of drilling, distances between drills, ridge and flat work, size of field, time of delivery of beet, etc.

An Economic and Financial Analysis of Fifteen East Anglian Farms, 1926-27, pp. 22, 5 tables.

Report No. 10 is one of the series of economic and financial analyses and covers fifteen East Anglian farms for the year Michaelmas 1926-27. The net returns recorded are the lowest achieved during the four years 1923 to 1927, representing only 0.9 per cent. on capital. Taking all the farms together the crops left a small profit and the livestock a considerable loss. The cost of milk is represented by an average of 1s. 4d. per gallon on a total of some 90,000 gallons. Subsidiary tables in the text give the details of milk and poultry costs and profits.

MIDLAND AGRICULTURAL COLLEGE.

JONES (A.). **Agricultural Insurance**. *Scott. Journ. Agric.*, vol. xi, No. 2.

This article raises the question of the adequacy of existing insurance facilities to meet the needs of agriculture. Insurance of buildings, stock and crops against the hazard of fire and workmen against accidents can be fully and inexpensively covered. Where the risks are peculiar to agriculture, such as those of hail, crop, and livestock, the farmer has not the comparatively inexpensive facilities enjoyed in other business concerns. Agricultural insurance experience of other countries is noted and the article concludes on the problems of organisation and selection of risks.

JONES (A.). **Livestock Insurance**. *Scott. Journ. Agric.*, vol. xi, No. 3.

In this article special attention is given horse and cattle insurance. It is pointed out that although considerable insurance business is done by joint stock companies insuring pedigree stock very little is effected on the commercial livestock of the farm. Tables are given showing the sum insured for given rates of premiums in the various classes of horses and cattle. Mention is made of two forms of mutual cattle insurance societies in this country which attempt to cover the farmer and the butcher against losses due to diseased carcasses. The absence of statistical information is noted and a table extracted from a veterinary officer's report clearly shows the seriousness of the problem of diseased animals in this country. It is concluded that commercial livestock will remain uncovered until the premiums become less prohibitive than they are at present.

JONES (A.). **Science and Economics.** *Derbyshire Farm.*, vol. viii, No. 2.

This paper traces briefly the development made in agricultural scientific research. It is pointed out that after Liebig's discoveries and until the second decade of this century the work of research workers was directed to problems of plant and animal breeding, chemistry and so forth, and very little to the economic aspects of the subject.

With the formation of the Agricultural Economics Institute at Oxford in 1911 and the more recent appointment of economists to various provinces under the Ministry's advisory scheme the "business" side of the industry has been given increasing attention. The various methods of tackling these economic questions and the information it is hoped to obtain concludes the article.

SEALE-HAYNE AGRICULTURAL COLLEGE.

LONG (W. H.). **Report of the Advisory Departments, 1927.** *Seale-Hayne Coll. Pamph. No. 27. Dept. Econ.*, pp. 17-23.

This section of the pamphlet explains the aims and progress of the Economics Department since the Department was first established in April, 1926. The energies of the Department have been mainly concentrated on the work of analysing farmers' financial accounts for the purposes of comparing different systems of farming within the Province. A paragraph is devoted to the work done in costing the 1926 sugar beet crop in Devon and Cornwall, while an account of a study of the extra costs of producing graded milk in the province, carried out in the summers of 1926 and 1927, is also included.

LONG (W. H.). **The Economics of the Sugar Beet Crop.** *Estate Mag.*, May, 1928.

This article deals with the history of the sugar beet crop in this country, and explains the method by which the subsidy is granted. The various items entering into the costs of production of the crop, and the different headings under which returns from beet can be divided, are discussed. Special reference is made to conditions in the south west, where progress has been retarded on account of the absence of a factory, and the article concludes with a reference to the "Oxford Process," and the effect of the subsidy on the sugar refining industry of the country.

LONG (W. H.). **Sugar Beet.** *Western Morning News (Agric. Supp.)*, June 13th, 1928.

This article discusses the future of sugar beet in the south-west, dealing with the subject, first from the point of view of the farmers, and secondly from the point of view of the factory companies. Some average figures of costs and returns, worked out from records collected in Devon and Cornwall, indicate that with the reduced subsidy operating for the 1928-31 crops, it should still be possible to grow the crop at a profit, assuming that transport costs are not unreasonably high. In this connection, the possibilities of the "Oxford Process" are discussed.

SOUTH EASTERN AGRICULTURAL COLLEGE, WYE.

WYLLIE (J.). **Investigation into Costs of Production and Financial Results. Rep. No. 5. Poultry Keeping. Costs and Financial Results for four yrs., 1923-24—1926-27** (pp. 103-120). *S. E. A. Coll.*

The results from 17 farms over a four-year period are summarised and discussed. The need for further investigation into the possibilities of

keeping poultry on the ordinary farm on a commercial scale, i.e. in flocks of not less than 800 to 1,000 birds, is emphasised.

WYLLIE (J.). **Investigation into Costs of Production and Financial Results. Rep. No. 6—Corn-growing. Costs of Production and Financial Results**, pp. 121–159. *S. E. A. Coll.*

The results from 19 farms for the harvest years 1924, 1925 and 1926 are given in detail, together with summaries for each year and each crop. The outstanding result is an over-all loss of 7s. 7d. per acre from the 1926 corn crops compared with a profit of 39s. 7d. per acre in 1924 and 13s. 2d. per acre in 1925.

WYLLIE (J.) & KNOX (M. A.). **A Clay Farming Episode.** *Journ. S. E. A. Coll.*, 1928, pp. 208–217.

An account of the financial results on a clay land farm from the date of ingoing at Michaelmas, 1923, until the date of selling off at Michaelmas, 1926. The important part played by the weather conditions during that period is clearly brought out.

UNIVERSITY COLLEGE OF NORTH WALES, BANGOR.

ROBERTS (E. JONES). **The £ s. d. of the Flying Flock of Welsh Mountain Ewes.** *Estate Mag.*, November, 1927.

The effect of suitable and unsuitable pastures on the percentage of culls and also on the profits is given, an investigation having been carried out at three farms. At one farm there were no culls and the receipts per 100 lambs amounted to £195; at the most unsuitable of the three farms, the percentage of culls was 23 and the receipts (including value of culls) per 100 lambs amounted to £154. The difference in profits is greater than appears from these figures since badly thriving lambs make it difficult to clear the ewes. The effect of choice of ram on the weight of lambs is also discussed.

UNIVERSITY COLLEGE OF WALES, ABERYSTWYTH.

ASHEY (A. W.). **Economic Conditions in Welsh Agriculture: Suggestions of Some Remedies.** *Pub. by Agric. Econ. Dept., Univ. Coll., Aberystwyth*, 1928, pp. 37.

The existing conditions of finance and financial returns on Welsh farms are due chiefly to changes in the markets, changes in demand and prices and to changes in the purchasing power of farmers' money incomes. Welsh farmers have been favoured to some extent because animal products have given better returns in prices than the cereals. The position as regards prices of requirements is that costs of use of land, prices of fertilisers and feeding stuffs have been relatively low; while prices of tools and implements and costs of labour have been high. On the whole, costs of production requirements have not been higher than prices of products. But farmers have felt the effect of the "lag" between expenditure and receipts. It is doubtful whether there was any real loss of productive capital in the whole of the industry prior to the end of 1925. Since then there have been indications of reductions in real productive capital and of a declining standard of living. Remedies for the present position are to be found in organisation of the farms and direction of production to meet the best existing demands for produce.

ASHBY (A. W.) & JONES (J. MORGAN). **Co-operative Business in Agricultural Requisites: The Control of Credit.** *Pub. by Agric. Econ. Dept., Univ. Coll., Aberystwyth, 1927, 13 pp.*

The advisory bulletin opens with a statement of the problem of long credits and an illustration of the results of two societies with good and bad conditions in this respect. After a description of common practice in the fixing of prices and credit policy, the various methods of control are discussed in their relation to the society and its customers. An examination of a number of conditions indicates good office organisation; and the attitude of manager and committee, which has also been published separately, is a summary of the results of credit, drawn up for circulation among members and customers of co-operative societies.

ASHBY (A. W.) & JONES (J. MORGAN). **Agricultural Co-operation in Wales.** *Yr. Bk. Agric. Co-op. Brit. Emp., 1928, 24 pp.* Reprinted.

The first sections of this study give an historical outline of the factors underlying co-operative development in Welsh agriculture. The work of bodies interested in agricultural organisation bore fruit largely because changes in farming systems opened up new avenues of business in agriculture. Success has been widespread in the supply of requisites, though the joint marketing of produce has had a chequered career, partially due to conditions which placed the small dealer in a strong position. After a brief review of the produce societies, the discussion centres on the business problems of requisites societies and concludes by emphasising the necessity for a better appreciation of the principles and practice of co-operation on the part of farmers.

JONES (J. MORGAN). **Agricultural Co-operation in South Wales: An Economic and Financial Analysis.** *Pub. by Agric. Econ. Dept., Univ. Coll., Aberystwyth, 1927, 36 pp.*

This survey of the co-operative movement in South Wales shows that in 1926, forty-eight societies did a trade of nearly £850,000, though only £33,580 of this was in farm produce. The main part of the study is taken up by a financial analysis of the capitalisation and trading of the 42 requisites societies. Most of those are in a strong position, owning 65 per cent. of the capital employed, although the greater part of the members' interest takes the form of reserves and accumulated profits. To show the influences of the varying factors determining financial results, societies have been grouped according to the varying amounts of expenses incurred, credit given and profits and losses made. The analysis goes to show the influence of giving long credits on the amounts of capital required, the rapidity of its turnover, the expenses incurred and consequently the prices at which goods can be offered. The concluding section emphasises the need for more co-operation between individual societies, and indicates the scope for future development, especially in the sale of produce.

JONES (J. MORGAN). **Factors Affecting the Prices of Pigs in Wales.** *Welsh Journ. Agric., 1928, vol. iv, 21 pp.* Reprinted.

This study opens with a description of the types of pig husbandry in Wales, showing the chief areas devoted to pork and bacon production. The treatment of the cyclical character of pig prices emphasises the clear connection between the pig population and pig prices. Service records of boars kept under the Livestock Scheme show that farmers try to adjust breeding to prices and that their mis-calculation of future supplies and demand is responsible for over- or under-production. A second feature of pig prices is the seasonal fluctuation within each year. Fat pig prices vary largely according to

variations in consumption and the demand of curers. These factors also influence the prices of store pigs of various ages, although the farm supply of milk by-products and other foodstuffs influences the prices of feeding pigs. More knowledge of market demand in the matter of quantity and quality would put the industry on a sounder basis.

JONES (J. MORGAN) & WYNNE (R. HARDING). Agricultural Co-operation in North Wales: A Study in Experience. *Pub. by Agric. Econ. Dept., Univ. Coll., Aberystwyth, 1928, 82 pp.*

This report is an attempt to examine the present position and past experience of co-operation in North Wales as a preliminary to the consideration of the needs of further organisations and their forms. The historical introduction, together with the survey of the present position, indicates the many fields into which co-operation has penetrated in the area. These experiments, ranging from "land purchase to the growing of daffodils," are in turn examined and much statistical data is incorporated. While the examination of past experience shows the necessity of obeying the laws of business, the evidence especially emphasises the interrelation of marketing and production. The failure of the dairy societies is attributed mainly to the fact that they set up a marketing organisation which did not harmonise with the system of farming. It is concluded that to succeed, societies must provide a service, the need of which is consciously felt by those concerned.

WYNNE (R. HARDING). Prices of Dairy Cows and Dairy Produce. *Welsh Journ. Agric., 1928, vol. iv, 22 pp.* Reprinted.

In the introductory survey of dairying in Wales, the interrelation of milk production and store stock-raising over the greater part of the Principality is emphasised, and the various factors accountable for the importance of butter production are enumerated. The study of long period price trends which follows shows the intimate connection between dairy cow prices and the prices of dairy products. This harmony also extends to the seasonal price movements, and it is shown that fluctuation in the prices of butter and cheese within the year are largely due to fluctuations in home supplies. A separate return deals with the different conditions which determine the production and prices of liquid milk. The seasonal demand for dairy cows is generally largely governed by the need of keeping up a level milk supply, though this relation is not so clear in the Principality.

LEWIS (T.). Potato and Root Crops on Welsh Farms. Analysis of Cost, 1926. *Welsh Journ. Agric., 1928, vol. iv.*

The acreage of swedes, turnips and potatoes followed fairly closely, in proportion, the decline in the total arable acreage of Wales during the period 1884-1926.

Mangolds, on the other hand, increased in acreage during the same period. Few potatoes are grown for sale in the Principality. During the above period yields per acre showed an upward tendency until the war. During the war yields fell appreciably, but have shown a marked improvement since. Cost of production has had a large influence on the acreage devoted to these crops. Price on the other hand would not appear to have exerted much influence on the acreage, root crops and potatoes being grown for consumption by live stock and family respectively on the farm.

Costs of production for these crops were obtained on 11 Welsh farms during 1926, and are analysed.

(13) PRESERVATION AND TRANSPORT.

HORTICULTURAL RESEARCH STATION, EAST MALLING, KENT.

MACKENZIE (A. D.). **The Preservation of Fruit in Natural Colours.** *Mus. Journ.*, 1928, vol. xxviii, pp. 6-16.

Apples, pears, plums, cherries, and small fruits, together with their foliage, have been successfully preserved by the use of various modifications of the paraffin, the sulphurous acid, the formalin, and the copper sulphate methods.

Owing to the variations of colour and texture, even among individuals of the same variety, the appropriate modifications of the methods have been arrived at by a process of "trial and error."

Specimens thus preserved, when adequately mounted, have so far remained in satisfactory condition, without attention, for three years.

Detailed notes of general formulæ of preserving solutions are given, with indication as to necessary modifications.

FRUIT AND VEGETABLE PRESERVATION RESEARCH STATION, CAMPDEN; AND LONG ASHTON FRUIT RESEARCH STATION.

APPLEYARD (A.) & HIRST (F.). **Experiments on the Preservation of Tomatoes.** *Ann. Rep. Agric. & Hort. Res. Stat.*, 1927.

In the grading of tomatoes, small fruit known in the trade as "chats," and fruit which is split or irregular in shape are rejected. Experiments were carried out to ascertain if this fruit could be utilised for canning or for making tomato products. In making tomato sauce and chutney it was found advisable to use boiling pans, pulpers, etc., made from a metal which would not be attacked by the acid in the fruit. Aluminium proved more satisfactory than copper for this purpose. The products made were in all cases excellent, and they sold very readily.

APPLEYARD (A.) & HIRST (F.). **Preliminary Experiments on Commercial Canning.** *Ann. Rep. Agric. & Hort. Res. Stat.*, 1927.

An experiment on the canning of plums was carried out on the premises of the Littleton and Badsey Growers. Some 2,000 cases of No. 2½ cans, and 200 cases of gallon cans of plums and damsons were packed. The work was carried out under difficult conditions and with improvised machinery, but the cost data were so encouraging that the Society decided to instal a complete automatic canning line.

A similar experiment was carried out at East Farleigh, and satisfactory results were obtained with the varieties Early Rivers, and Victoria, whilst Czars proved entirely unsatisfactory. The small Kent damson also proved suitable for canning.

APPLEYARD (A.) & HIRST (F.). **Experiments on the Production of English Fruit Juices and Syrups.** *Ann. Rep. Agric. & Hort. Res. Stat.*, 1927.

On the whole, the natural juices were disappointing, being very unpalatable in flavour and rather poor in colour. A much better product was obtained by adding sugar to the juice until the density of the syrup was 45 to 50 degrees Balling. In the making of cold process fruit syrups it was found to be

difficult to get the juice saturated quickly with sugar. These syrups kept well for a few months, but after lengthy storage slight fermentation was perceptible. Excellent syrups were obtained from black currants, raspberries, loganberries and red currants.

HIRST (F.). The Preserving Qualities of Different Varieties of Fruit and Vegetables : Canning and Bottling Trials : (2) Peas. *Ann. Rep. Agric. & Hort. Res. Stat.*, 1927.

Of the varieties tested, the following gave the best results :—

1. Small Peas : Alaska; Chemin Long No. 4; Annonay; Gontier Blanc.
2. Medium Size : Bountiful; Scimitar; Advancer; Delicatesse.
3. Large Peas : Lincoln; Prince of Wales; Gradus; Yorkshire Hero.

Peas grown for canneries should ripen uniformly, so that they can be cut by machinery. Further experiments are necessary to determine which varieties are the best from this point of view.

HIRST (F.). The Effect of Sugar, Acid and "Set" on the Keeping Properties of Jams. *Ann. Rep. Agric. & Hort. Res. Stat.*, 1927.

Experiments were carried out to ascertain :—

- (a) What sugar concentration is necessary to prevent fermentation and mould growth.
- (b) The inhibiting effect of acid on the growth of yeasts and moulds.
- (c) Whether the "set" of the jam plays any part in preventing fermentation.

The experiments showed that the keeping property of jam depends on three factors : sugar, acid and the "set." The latter appears to play an important part in preventing fermentation, as in a well-set jam it is difficult for the yeasts to get into the product. It was also shown that 65 per cent. sugar is necessary to prevent slight fermentation if wild yeasts gain access to the jam.

HIRST (F.) & ADAM (W. B.). Preliminary Report on Lacquer Tests. *Ann. Rep. Agric. & Hort. Res. Stat.*, 1927.

Following several enquiries as to the necessity or otherwise of double lacquering, experiments were carried out in collaboration with the lacquer manufacturers and the can makers. The following fruits were canned to ascertain to what extent the fruit acids acted on the different lacquers : gooseberries, rhubarb, Victoria plums, and tomato puree. With rhubarb the single lacquers were badly attacked, but with double lacquers there was no sign of penetration. When soft fruits are canned, the colours are often spoilt, due to the bleaching action of the tin wherever it is exposed. Double lacquering prevented this discoloration.

GROVE (O.) & BARKER (B. T. P.). Cider making Trials with Tasmanian Apples. *Ann. Rep. Agric. & Hort. Res. Stat.*, 1927.

This paper records the detailed results of cider making trials of ten varieties of eating apples grown in Tasmania, made for the purpose of ascertaining if low-grade and surplus fruits of those varieties could be utilised for cider-making purposes. It is concluded that a satisfactory commercial cider could generally only be produced from such material when used in conjunction with true vintage types of cider apples.

LOW TEMPERATURE RESEARCH STATION, CAMBRIDGE.

BARKER (J.). **The Nature and Prevention of Wastage in Australian Fruit Imported into England in 1928.** *Journ. Counc. Scient. Indust. Res. Australia*, Aug., 1928, vol. i, No. 5.

The wastage in imported Australian apples is attributed mainly to the diseases, internal breakdown and bitter pit. The need for further experimental work in Australia on the factors determining the development of these diseases is stressed.

MORAN (T.) & SMITH (E. C.). **The Conditioning and Ripening of Meat.** *Proc. Brit. Assoc. Refrig.*, 1927-28, vol. xxiv, No. 2.

MORAN (T.) & VICKERY (J.). **The Preservation and Transport of Frozen and Chilled Beef.** *5th Internat. Cong. Refrig.*, Apr., 1928.

RESEARCH INSTITUTE IN PLANT PHYSIOLOGY, IMPERIAL COLLEGE OF SCIENCE AND TECHNOLOGY, LONDON.

ARCHBOLD (H. K.). **The Chemical Composition of Mature Apples and its Relationship to Environment and to the Rate of Chemical Change in Storage.** *Ann. Bot.*, 1928, vol. xlii.

Developing and mature apples (Bramley's Seedling) from different localities and grown in different seasons have been analysed to determine the effect of environmental factors on the chemical composition of the fruit. Dry weight, acid, and nitrogen show large variations, the first two with respect to locality and season, but nitrogen to locality only. With low temperature or lack of sunshine and high rainfall acid appears to rise and dry weight and sucrose to decrease as compared with more favourable conditions.

ARCHBOLD (H. K.). **Further Investigations of the Method of Determining Dry Weight of Apple Pulp.** *Ann. Bot.*, 1928, vol. xlii.

When simple sugar and acid solutions of the same concentration as in apples are dried they show a continuous loss of weight, even at 50°C. in vacuo, no satisfactory end-point being reached. Results accurate to within 2 per cent. can be obtained by (1) drying in vacuo at room temperature for three weeks, (2) drying at 50°C. at atmospheric pressure for an arbitrary time which must be standardised for the apparatus used; for the ventilated electrically heated oven employed a period of 44 hours was found necessary.

ROTHAMSTED EXPERIMENTAL STATION.

DAY (F. E.). **Small Scale Brewing in the Laboratory.** *Journ. Inst. Brew.*, Oct., 1928, vol. xxxiv.

A technique has been devised for obtaining a reasonable top yeast crop and beer of normal flavour in the small scale brewings in the Laboratory. Filtration is avoided and brewery conditions are imitated as closely as possible by conducting the fermentation in Thermos flasks. The method can be applied to the comparison of small samples of malts and the examination of hops.

SOUTH-EASTERN AGRICULTURAL COLLEGE, WYE.

GOODWIN (W.) & SCRIVENER (F. L. C.). Losses on Storage of Farm Crops, 1926-27. A. Corn (Oats, Barley, Wheat). *Journ. S.E.A. Coll.*, 1928, No. 25, p. 195.

The most striking feature was the small amount of change which took place in the various kinds of grain during six months' storage in the stack. The bushel weight, the 1,000 grains weight and the head and tare corn remained practically constant. The loss which grain undergoes in the stack under good average conditions probably does not exceed 1 per cent. The large losses which occur in practice are either due to bad stacking or vermin.

GOODWIN (W.) & MARTIN (H.). Losses on Storage of Farm Crops. B. Potatoes. *Journ. S.E.A. Coll.*, 1928, No. 25, p. 198.

The results are given of analyses made each month on potatoes stored in a clamp for eight months. The true protein remained constant from October to January. In the February sample sprouting had just begun and from this point onward the protein and sucrose began to decrease. In the April and May samples there was an increase in the reducing sugar. The starch and crude fibre figures showed anomalies.

(14) MISCELLANEOUS.**HORTICULTURAL RESEARCH STATION, EAST MALLING.**

CHAPELOW (H. C.) & TYDEMAN (H. M.). **Weather Conditions during 1927.** *E.M.R.S. Ann. Rep.*, 1927. (I General), pp. 85-88.

NATIONAL INSTITUTE FOR RESEARCH IN DAIRYING.

WRIGHT (N. C.) & RULE (W.). **A Simple Form of Rotating Dialyser.** *Journ. Biol. Chem.*, Oct., 1927, vol. lxxv, pt. 1.

The dialyser, consisting of two glass funnels of equal dimensions with ground edges holding between them the membrane, is made airtight by the adjustment of four iron bolts running through wood blocks. The stirring of the solutions is done by means of a pulley wheel and belt fixed to one of the funnel stems. The advantages consist in its cheapness and the ease with which it can be assembled, the rapidity with which equilibrium can be attained and the protection of the solutions from contamination

ROTHAMSTED EXPERIMENTAL STATION.

FISHER (R. A.). **On some objections to Mimicry theory: statistical and genetic.** *Trans. Ent. Soc. Lond.*, 1927, vol. lxxv, pp. 269-278.

The statistical reasoning which led Marshall to dispute the applicability of Muller's theory to the mimetic approach of a more numerous to a less numerous form, is shown to be unsound, and the validity of Muller's argument is verified. The contention of Punnett that in certain cases mimetic forms must have arisen by saltations falls with Marshall's argument on which it is based. The more recent study of modifying factors shows that the Mendelian inheritance observed in polymorphic mimics does not show that these forms were not gradually evolved by natural selection; while the stability of the gene ratio of these factors implies selective action.

FISHER (R. A.). **The possible modification of the response of the wild type to recurrent mutations.** *Amer. Nat.*, 1928, vol. lxii, pp. 115-126.

The reaction of the wild type to mutations is known in many cases to be capable of somewhat rapid modification in experimental conditions, by the selection through differential viability of factors capable of modifying this response.

It may be calculated that with mutation rates of the order of one in a million the corresponding selection in the state of nature, though extremely slow, cannot safely be neglected in the case of the heterozygotes.

The observed behaviour of multiple allelomorphs largely supports, though that of specific modifiers seems to oppose, the view that complete dominance generally may be regarded as a product of such selective modification.

FISHER (R. A.) & BHAI BALMUKAND. **The estimation of linkage from the offspring of selfed heterozygotes.** *Journ. Genet.*, 1928, vol. xx, pp. 79-92.

Five methods of solution are given of the statistical problem presented by typical linkage data. The example chosen shows the various errors.

into which the use of inefficient statistics leads. Of the efficient methods the method of maximum likelihood possesses the advantage that it may be applied directly to any analogous problem, and is related in a previously unsuspected way to the measure of discrepancy X^2 . The produce ratio method, for using which a table is provided, enjoys the practical advantages of other efficient solutions, and is in addition unaffected by differential viability, if this is caused by one factor only. The method of minimum X^2 , unlike the other two, is laborious in computation, and seems to possess no special theoretical interest.

FISHER (R. A.) & TIPPETT (L. H. C.). Limiting forms of the frequency distribution of the largest or smallest member of a sample. *Proc. Camb. Phil. Soc.*, 1928, vol. xxiv, pp. 180-190.

The distribution of the greatest or least of a sample of n may be derived from that of the population sampled. If it tends to any limiting form as the size of the sample is increased, its distribution must obey a functional relation the solution of which is here given, with a discussion of the criteria which determine the limiting form, and of the gradual approach to the limit shown in normal samples.

HOBLYN (T. N.). A statistical analysis of the daily observations of the maximum and minimum thermometers at Rothamsted. *Quart. Journ. Roy. Meteor. Soc.*, 1928, vol. liv, pp. 183-202.

Daily records of maximum and minimum temperature at Rothamsted are available for 49 years. This paper gives an analysis of the means, variances and covariance for each month, and discussions of the contribution to the total variation ascribable to variations from day to day and from year to year.

WISHART (J.). On Errors in the Multiple Correlation Coefficient due to Random Sampling. *Mem. Roy. Meteor. Soc.*, 1928, vol. ii, No. 13, pp. 29-37.

The use of the Multiple Correlation Coefficient in Meteorological and Agricultural problems is common where the effect of a number of independently varying factors on, say, the weather of a particular locality, is investigated. An experimental study is made of the kind of values, with their frequency of occurrence, which would arise from chance factors which had in reality no influence on the phenomenon studied. The mathematical theory for this particular case is already complete, and it is here shown how the probability of occurrence of any value can be calculated. This method of testing the significance is recommended in place of the more usual probable error, for the distribution is far from normal.

WISHART (J.). Table of Significant values of the Multiple Correlation Coefficient. *Quart. Journ. Roy. Meteor. Soc.*, 1928, vol. liv, pp. 258-9.

This table gives the values of the Multiple Correlation Coefficient that would occur in random sampling from uncorrelated material for the 1 and 5 per cent. levels of significance, and is based on the theory mentioned in the preceding memoir, and in the table given in "Statistical Methods." It is carried as far as 6 independent variates and up to samples of 100.

WISHART (J.). **Le traitement exact des Problemes de Correlation Multiple en Meteorologie et Agriculture.** *Read before the " Association Francaise pour l'avancement des Sciences,"* 1928:

The use of the Multiple Correlation Coefficient and its testing by the preceding significance tables is explained, and examples, taken from the weather forecasting work of Sir Gilbert Walker, are worked out. Comment is made on the recent correspondence in *Nature* on the use of the probable error in correlational work.

WISHART (J.). **The Generalised Product Moment Distribution in Samples from a Normal Multivariate Population.** *Biometrika*, 1928, vol. xxa, pp. 32-52.

The distribution of the variance was first given by " Student " in 1908. The next advance was in 1915, when R. A. Fisher, for a two-variate population, gave the simultaneous distribution of the three second order moment coefficients, namely the two variances and the cross product moment (or co-variance). In this paper the problem is generalised to include any number of variates, and the multiple distribution of all second order product moment coefficients is deduced. A table follows giving the moment coefficients of this distribution, as far as the fourth order and eight variates.

WISHART (J.). **A problem in Combinatorial Analysis giving the Distribution of certain Moment Statistics.** *Proc. Lond. Math. Soc.*

The method outlined in the previous paper for deducing the moments of the distribution from a particular generating function is tedious, and it is here shown that it is, after all, only a particular case of a more general problem in Combinatorial Analysis. The correspondence between the theories is indicated, and the special problem, which can be considered as a ring arrangement of rods, is worked out in full. Of this an operational solution is demonstrated, and the arithmetical procedure for building up any required result is illustrated in an example.

WISHART (J.). **Sampling Errors in the theory of Two Factors.** *Brit. Journ. Psych.*, 1928, vol. xix, Part 2.

It is a mathematical consequence of the theory that any ability can be resolved into two factors, one general and the other specific, that the tetrad difference of correlation coefficients between any four abilities should vanish, within the limits of random sampling error. A modified definition of the tetrad is introduced in order that the distribution reached in the previous paper but one (above) should be capable of application to this problem. An exact formula is then deduced for the standard error of the tetrad, and this is applied to some published results of psychological experiments.

STOUGHTON (R. H.). **A Method of Maintaining Constant Humidity in Closed Chambers.** *Journ. Scient. Instrum.*, 1928, vol. xi, pp. 364-366.

The apparatus is very simple, consisting of a carbon filament electric lamp enclosed in a tin and covered with muslin dipping into a vessel of distilled water outside. Air is blown through a glass nozzle within the tin and passes on into the chamber through a funnel-shaped tube. When the lamp is glowing the air stream carries with it water vapour evaporated from the muslin. The current to the lamp is controlled by a hygrostat within the chamber operating through a relay. For low humidities the air stream must be dried before passing it through the apparatus.

WELSH PLANT BREEDING STATION, ABERYSTWYTH.

JONES (MARTIN G.). **Meteorological Conditions at Aberystwyth 1894-1927.** *Welsh Journ. Agric.*, Jan., 1928, vol. iv, p. 254.

Data are given of the records of rainfall, sunshine and temperature. A comparison is made of the distribution per season—spring, summer, autumn and winter—within consecutive ten year periods, and also between dry, medium and wet years respectively.

The high rainfall from July to October and the low rainfall from February to June are very marked.

A correlation is also shown for the "amount of sunshine received" to the "maximum possible sunshine." This indicates that the "amount of sunshine received" is governed more by the "number of rain-days (.01 inch") than by the amount of the rainfall itself.

Monthly values are given for the years 1920-27. They show very clearly how the rainfall during the months of July, August and September (the harvest months) was much heavier in these years than for the corresponding months as averaged for the whole 34 year period.

A point of supreme importance to the practical farmer is that the months of July and August are far wetter—having more rain and less sunshine—than June, thereby stressing the advantage of an early hay cut.

SEALE-HAYNE AGRICULTURAL COLLEGE.

Report of the Advisory Departments. Seale-Hayne Agricultural College, Newton Abbot, Devon. *Coll. Pamph.*, 1927, No. 27, 34 pp.

This is a joint report by five advisory officers describing the main lines along which research work is being carried out in this district, and is intended for the non-technical reader. The soil requirements from the point of view of lime and potash are closely correlated with the main soil types, which also appear to influence the growth of certain crops such as lucerne.

The plant pathological section is covered in a separate report.

The economics section gives the tabulated results from the study of different systems of farming and discusses the economic aspect of sugar-beet, graded milk, etc.

UNIVERSITY COLLEGE OF NORTH WALES.

WALTON (C. L.). **Rooks and Agriculture in Mid and North Wales.** *Welsh Journ. Agric.*, 1928, vol. iv, pp. 353-356.

The writer made an approximate census of rookeries and the rook population of the Aberystwyth district in Mid Wales during a survey of agricultural zoology carried out during 1913-16, and a similar one for North Wales between 1920-27. The two areas are compared and contrasted as regards type of country, farming, etc., and the number of cases of damage by rooks reported in each area.

The rook population was much more dense in the Mid Wales district, and the cases of injury to crops more numerous. Attention is drawn (and a case cited) of rooks as carriers and distributors of the Gape Worm (*Syngamus trachealis*).

APPENDIX.

LIST OF ABBREVIATIONS USED IN THIS VOLUME.

Agric. Res.	Agricultural Research.
Agric. Prog.	Agricultural Progress.
Amer. Nat.	American Naturalist.
Ann. Rep. Chem. Soc.	Annual Report of the Chemical Society.
Ann. & Mag. of Nat. Hist.	Annals & Magazine of Natural History.
Ann. App. Biol.	Annals of Applied Biology.
Ann. Bot.	Annals of Botany.
Ann. Rep. Long Ashton Res. Stat.	Annual Report of the Long Ashton Research Station.
Ann. Rep. Soc. Chem. Ind.	Annual Report of the Society of Chemical Industry.
Aberdeen Ang. Rev.	Aberdeen Angus Review.
Ann. Trop. Med. & Parasit.	Annals of Tropical Medicine & Parasitology.
Agric. Econ. Res. Inst.	Agricultural Economics Research Institute.
Bioch. Journ.	Biochemical Journal.
Brit. Journ. Exp. Biol.	British Journal of Experimental Biology.
Brit. Journ. Psych.	British Journal of Psychology.
Brit. Mus.	British Museum.
Brit. Journ. Exp. Path.	British Journal of Experimental Pathology.
Bull. Ent. Res.	Bulletin of Entomological Research.
Bull. Ent. Soc. Hawaiian Sug. Plant. Exp. Stat.	Bulletin of the Entomological Society of Hawaiian Sugar Planters' Experiment Station.
B.O.A.S.	Board of Agriculture for Scotland.
Brit. Goat Soc. Month. Journ.	British Goat Society's Monthly Journal.
Brit. Med. Journ.	British Medical Journal.
Black's Vet. Dict.	Black's Veterinary Dictionary.
Biol. Genet. Bd.	Biological Genetics Board.
Berks. Milk Rec. Ann. Rep.	Berkshire Milk Recording Society's Annual Report.
Camb. Univ. Press	Cambridge University Press.
Chem. Yr. Bk.	Chemists' Year Book.
Cereal Chem.	Cereal Chemistry.
Emp. Cott. Grow. Rev.	Empire Cotton Growing Review.
Emp. For. Journ.	Empire Forestry Journal.
Ent. Month. Mag.	Entomologist's Monthly Magazine.
Essex F.U. Yr. Bk.	Essex County Farmers' Union Year Book.
Edin. Med. Journ.	Edinburgh Medical Journal.
Eugen. Rev.	Eugenics Review.
E.M.R.S. Ann. Rep.	East Malling Research Station Annual Report.
Fed. Wom. Inst.	Federation of Women's Institutes.
Food Invest. Bd. Spec. Rep.	Food Investigation Board Special Report.
Gard. Chron.	Gardeners' Chronicle.
Hereford Breed Ann. Breed. Guide.	Hereford Breed Annual and Breeders' Guide.
Journ. Bath & West & South. Count. Soc.	Journal of the Bath and West and Southern Counties Society.
Journ. Hyg.	Journal of Hygiene.
Journ. Soc. Chem. Ind.	Journal of the Society of Chemical Industry.

Journ. Brit. Assoc. Advance- ment Sci.	Journal of the British Association for the Advancement of Science.
Journ. Agric. Sci. ..	Journal of Agricultural Science.
Journ. Inst. Brewing ..	Journal of the Institute of Brewing.
Journ. Min. Agric. ..	Journal of the Ministry of Agriculture and Fisheries.
Journ. Queckett Micros. Club.	Journal of the Queckett Microscopical Club.
Journ. Agric. Res. ..	Journal of Agricultural Research.
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Journ. N.I.A.B.	Journal of the National Institute Agricultural Botany.
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Journ. Helm.	Journal of Helminthology.
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Journ. Genet.	Journal of Genetics.
Journ. Scient. Instrum. ..	Journal of Scientific Instruments.
Journ. Text. Inst. ..	Journal of the Textile Institute.
Journ. Physiol.	Journal of Physiology.
Journ. Biol. Chem. ..	Journal of Biological Chemistry (U.S.A.).
Journ. Ecol.	Journal of Ecology.
Journ. State Med. ..	Journal of State Medicine.
Journ. S.E.A. Coll. ..	Journal of the South-Eastern Agricultural College.
Journ. Roy. Hort. Soc. ..	Journal of the Royal Horticultural Society.
Journ. Counc. Scient. Indust. Res. Australia	Journal of the Council for Scientific and Industrial Research, Australia.
Journ. B.D.F.A.	Journal of the British Dairy Farmers' Associa- tion.
Journ. Anat.	Journal of Anatomy.
Lincs. Nat. Union Trans. ..	Lincs. Naturalists' Union Transactions.
Mem. Roy. Meteor. Soc. ..	Memoirs of the Royal Meteorological Society.
Min. Agric. Misc. Pub. ..	Ministry of Agriculture and Fisheries Mis- cellaneous Publications.
Mus. Journ.	Museums Journal.
Milk Ind.	Milk Industry.
Med. Res. Counc. Spec. Rep. Series.	Medical Research Council Special Report Series.
Manch. Guard.	Manchester Guardian.
Nat. Hist. of Wicken Fen.	Natural History of Wicken Fen.
N.F.U. Yr. Bk.	National Farmers' Union Year Book.
North West. Nat.	North-Western Naturalist.
Ox. Univ. Press	Oxford University Press.
Proc. Camb. Philos. Soc. ..	Proceedings of the Cambridge Philosophical Society.
Proc. Roy. Soc.	Proceedings of the Royal Society.
Proc. 1st Cong. Soil Sci. ..	Proceedings of the 1st Congress of Soil Sciences.
Proc. Lond. Math. Soc. ..	Proceedings of the London Mathematical Society.
Physiol. Rev.	Physiological Review.
Poult. & Rabb. Conf. ..	Poultry and Rabbit Conference.
Proc. World's Poult. Cong.	Proceedings of the World's Poultry Congress.
Proc. Roy. Phys. Soc. ..	Proceedings of the Royal Physical Society, Edinburgh.
Pig Breed. Ann.	Pig Breeders' Annual.
Proc. Roy. Soc. Med. ..	Proceedings of the Royal Society of Medicine.
Proc. U.S. Nat. Mus. ..	Proceedings of the U.S. National Museum.

Quart. Journ. Roy. Meteor. Soc.	Quarterly Journal of the Royal Meteorological Society.
Quart. Journ. Micros. Sci.	Quarterly Journal of Microscopical Science.
Quart. Rev. Biol.	Quarterly Review on Biology.
R.A.S.E.	Royal Agricultural Society of England.
Rep. Long Ashton Res. Stat.	Report of the Long Ashton Research Station.
Rep. Agric. Meteor. Conf. . .	Report of the Agricultural Meteorological Conference.
Rep. Cttee. Agric. Econ. . .	Report of the Committee on Agricultural Economics.
Rothamsted Conf.	Rothamsted Conference.
Science Prog.	Science Progress.
Soil Res.	Soil Research.
Seed Test. & Plant Registr. Stat. 1st Rep.	Seed Testing and Plant Registration Station, 1st Report.
Scott. Journ. Agric.	Scottish Journal of Agriculture.
Scient. Work.	Scientific Worker.
Scott. Farm.	Scottish Farmer.
Scott. Geog. Mag.	Scottish Geographical Magazine.
Soc. Serv. Bull.	Social Service Bulletin.
Trans. 1st Internat. Cong. Soil Sciences	Transactions of the 1st International Congress of Soil Sciences.
Trans. & Proc. Bot. Soc. Edin.	Transactions and Proceedings of the Botanical Society of Edinburgh.
Trans. 5th Internat. Cong. Refrig.	Transactions of the 5th International Congress on Refrigeration.
Trans. Roy. Soc. Edin. . .	Transactions of the Royal Society of Edinburgh.
Trans. Brit. Mycol. Soc. . .	Transactions of the British Mycological Society.
Trans. Ent. Soc. Lond. . .	Transactions of the Entomological Society, London.
Univ. Bristol Sug. Beet Trials	University of Bristol Sugar Beet Trials.
Vet. Journ.	Veterinary Journal.
Welsh Journ. Agric.	Welsh Journal of Agriculture.
Welsh Plant Breed. Stat. Bull.	Welsh Plant Breeding Station Bulletin.
West Scot. Agric. Coll. Res. Bull.	West of Scotland Agricultural College Research Bulletin.
Westmorland Gaz.	Westmorland Gazette.
World's Dairy Cong.	World's Dairy Congress.
Yorks. Record. Soc. Yr. Bk.	Yorkshire Recording Society's Year Book.
Yorks. Post Trade Rev. . .	Yorkshire Post Trade Review.
Yr. Bk. Agric. Co-op. Brit. Emp.	Year Book of Agricultural Co-operation in the British Empire.
Z. Induct. Abstamm. Vererb. Lehre Supptbd.	Supplementband der Zeitschrift für Induktive Abstammungs- und Vererbungs Lehre.

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